

Prepared by

Brad Onken, Entomlogist
Karen Felton, Biologist
And
Matthew Seese, Biological Science Technician

USDA Forest Service State and Private Forestry Forest Health Protection 180 Canfield Street Morgantown, WV 26505

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ABSTRACT

In the summer of 2005, USDA Forest Service personnel conducted surveys to evaluate hemlock woolly adelgid (HWA), *Adelges tsugae* population densities and to assess the need for treatment at the New River Gorge National River (NERI), the Gauley River National Recreation Area (GARI), and the Bluestone National Scenic River (BLUE). Current populations are sufficient to impact tree health in portions of the areas surveyed, and the use of imidacloprid on high-valued infested hemlock trees and the release of natural enemies including *Sasajiscymnus tsugae* (S.t.), Scymnus sinuanodulus (S.s.), and Laricobius nigrinus (L.n.) is recommended in the Fern Creek, Glade Creek, Grandview, Kates Branch, Wolf Creek areas of NERI, Hedricks Creek area of GARI, and a 3 mile stretch on the west side of Bluestone River downstream of the Mountain Creek Lodge of BLUE.

INTRODUCTION

HEMLOCK WOOLLY ADELGID

Adelgids are small, soft-bodied insects that feed exclusively on conifers. The family is divided into two genera: Adelges and Pineus. There are six species of Adelges that occur in North America, of which only one is native (Montgomery 1999), the Cooley spruce gall aphid (Adelges cooleyi). This adelgid occurs coast to coast in northern North America. Its primary hosts are recorded as white (Picea glauca), blue (Picea pungens), Sitka (Picea sitchensis), and Engelmann (Picea engelmannii) spruce (Baker 1972). It has an alternate host, Douglas fir (Pseudotsuga menziesii). There are 10 species of Pineus that occur in North America, of which seven are native. Four of these the pine bark adelgid (Pineus strobi); the pine leaf adelgid (P. pinifoliae); the red spruce adelgid (P. floccus); and the spruce gall adelgid (P. similes) seem to be indigenous to eastern North America (Drooz 1989, Montgomery 1999). These species attack eastern white pine (Pinus strobus), red spruce (Picea rubens), and black spruce (Picea mariana) but seldom cause extensive damage (Drooz 1989, Montgomery 1999). Little is known about the population dynamics, ecological role, or the predator and parasite complex associated with these native adelgids.

Native to Asia, the hemlock woolly adelgid (Adelges tsugae) is a pest of eastern hemlock (Tsuga canadensis) and Carolina hemlock (T. caroliana) (Onken et al. 1999), both of which are considered highly susceptible to the adelgid, with no documented resistance (Bentz et al. 2002). The latter tree species is found only in the southern region of the Appalachian Mountains (Onken et al. 1999). The HWA is currently established in 16 Eastern States from Georgia to Maine, and tree decline and mortality have increased at an accelerated rate since the late 1980s. For example, in the Shenandoah National Park (SNP), hemlock crown health has declined since the early 1990s. In 1990, greater than 77 percent of the hemlocks sampled were in a "healthy" condition; by 1999, less than 10 percent were in a "healthy" condition (Akerson and Hunt 1998). In another study at SNP, tree mortality significantly increased from an initial 8 percent in 1990 to nearly 50 percent in 2000 (Bair 2002). In New Jersey twelve years after initial HWA infestations, tree mortality reached more than 90% in some hemlock stands (Mayer et al 2002).

The hemlock woolly adelgid is parthenogenetic (an all-female population with asexual reproduction) that has six stages of development: the egg, four nymphal instars, and the adult, and two generations a year on hemlock; each adult adelgid can produce 50 to 300 eggs in her lifetime (McClure 1989, 1995). The hemlock woolly adelgid also has a winged form that is produced by the spring generation. This

form must complete part of its life cycle on spruce. The apparent lack of a suitable spruce host for this form in eastern North America results in a substantial loss of adelgids each year (McClure 1992b). Although natural mortality in HWA populations is commonly between 30 to 60 percent (McClure 1989, 1996), the reproduction potential of this insect remains high. Other mortality is generally attributed to two likely causes: 1) an extended period of cold temperatures or rapid temperature changes that coincides with a susceptible period of development for the adelgid, and/or 2) a sufficient loss in the nutritional quality and quantity of the food source, which is associated with the decline in health and vigor of the host tree (McClure 1996, Onken et al. 1999). Adelgid feeding can kill a mature tree in about 5 to 7 years (McClure et al. 2001). This tiny insect (~ 1 mm) feeds on all life stages of hemlock, from seedling to mature, old growth tree. The first instar nymphs, called crawlers, search for suitable sites at the base of the hemlock needles, and insert their feeding stylets into the young hemlock twigs and are committed to that feeding site throughout the remainder of its development. The stylet bundle is more than three times the length of the insect and penetrates deep within the plant tissues. HWA does not deplete nutrients directly by feeding on the sap, but rather by depleting the food reserves from the tree's storage cells (McClure et al. 2001). Dispersal and movement of HWA during its egg and mobile first instar stages is associated with wind, birds, deer, and other forest dwelling mammals. Humans also move the adelgid during logging and recreational activities and movement of infested nursery stock (McClure 1995). Natural enemies capable of maintaining low-level HWA populations are nonexistent in eastern North America (Van Driesche et al. 1996, Wallace and Hain 1998).

HWA was first reported in the western U.S. in the 1920s (Annand 1924, McClure 2001). HWA populations on western tree species, including western hemlock (*Tsuga heterophylla*) and mountain hemlock (*T. mertensiana*), appear to be innocuous; these tree species are believed to be resistant because little damage has been reported (McClure 2001). Unfortunately, both these trees are of limited value for hybridization and planting due to their poor adaptation to the east coast environment (Bentz et al. 2002). In the East, HWA was first reported in 1951 near Richmond, Virginia. It was considered to be more of an urban landscape pest and was controlled using a variety of insecticides applied with ground spraying equipment. Observations of the adelgid were periodically reported in several Mid-Atlantic States in the 1960s and 1970s but it was not until the 1980s that HWA populations began to surge and spread northward to New England at an alarming rate. By the late 1980s to early 1990s, infestations of HWA were reported to be causing extensive hemlock decline and tree mortality in hemlock forests throughout the East (McClure 2001).

SIGNIFICANCE OF HEMLOCK

Eastern hemlock is an extremely shade tolerant tree species, capable of surviving for as long as 350 years underneath a shaded forest canopy (Quimby, 1996). It is a slow-growing long-lived tree. It may take 250-300 years to reach maturity and may live for 800 years or more (Godman and Lancaster 1990). Eastern hemlock forests create distinctive microclimates and provide important habitat for a variety of wildlife, such as birds, fish, invertebrates, amphibians, reptiles and mammals. In the Northeast, 96 bird and 47 mammal species are associated with hemlock forests at some point during their life (Yamasaki et al. 2000). Hemlocks create a cooling effect in summer that is a critical factor in supporting trout populations. Studies have shown that removal of hemlock trees within 80 feet of a stream can cause temperatures to rise 6 to 9 degrees Celsius (Lapin 1994).

NERI, GARI, BLUE are USDI Park Service sites located in Fayette, Raleigh, Summers, Mercer, and Nicholas counties in West Virginia and have 72,189 acres, 11,507 acres, and 4,310 acres, respectively. Hemlock trees are a common component of the plant community at the NERI, GARI, and BLUE. Hemlocks form almost pure stands along many of the narrow high-gradient stream corridors and

frequently are co-dominant canopy trees on 10,190 acres within the three parks. Several stands of old growth hemlock stands ranging between 100 and 200 years old are scattered throughout the parks. At GARI there are a couple of hemlock stands approaching 300 years old.

Hemlock forests contribute greatly to the ecological, recreational, and aesthetic values of the three parks. Many waterfalls and wetlands are associated with hemlock forests and recreational activities such as hiking, trout fishing, bird watching, and general "sight-seeing" and picnicking are very popular and concentrated in these areas. Several rare bird species found only in areas where hemlock is a major component of the plant community within the three parks including Swainson's warbler, blue-headed vireo, cerulean warbler and Louisiana waterthrush.

Survey areas at the three parks were chosen based on ecological significance and/or visual importance. Hemlock stands at NERI are an important component of the forest canopy on about 5,990 acres (about 7%) of the total park acreage. Five areas at NERI surveyed for hemlock woolly adelgid populations were Fern Creek, Glade Creek, Grandview, Kates Branch, and Wolf Creek.

Fern Creek has one of the more dense hemlock stands at NERI. The Endless Wall Trail, located in the Fern Creek area, is 2.4 miles long, provides great views of the New River Gorge, and provides access to some of the best known climbing locations in the parks. A large portion of the stand is within a riparian zone. Breeding populations of the Swainson's warblers have been documented at Fern Creek, and the rare green salamander is known to occur there as well.

At Glade Creek there is a 5.6 mile trail that follows an abandoned railroad. The area is known for its waterfalls and is a popular trout stream.

Grandview has four developed overlooks with outstanding vistas and has a high visitor use. There are five trails ranging from 3/8 to 2 ½ miles in length. Hemlocks frame the vistas and are a major component of the rare rimrock forest community in this area. The rare Allegheny woodrat has been documented within the hemlock forests.

The Kates Branch area boarders the largest wetlands complex (approximately 20 acres) at NERI. The hemlocks contribute to the ecological integrity of this wetland. The Kates Plateau Trail follows an old logging road through this area.

At Wolf Creek, hemlock trees are a dominant component of the forest and there are trees ranging between 80 and 195 years old. Breeding populations of the rare Cerulan and Swainson's warbler, along with rare amphibians and the Allegheny woodrat occur in this area.

Hemlock stands at GARI are an important component of the forest canopy on about 4,000 acres (about 35% of the total park acreage). The area surveyed for HWA populations at GARI was in the Hedricks Creek area. This area has old growth hemlock stands with trees averaging 199 years old and some trees approaching 300 years old.

At BLUE the hemlock forests occur on about 200 acres (5% of the total park acreage). The survey area was along the west side of the Bluestone River on a 3 mile section of the Bluestone Tumpike Trail, downstream of the Mountain Creek Lodge. Hemlock trees found along the floodplain and side tributaries contribute to the scenery and ecological function of this wild and scenic river.

PREVIOUS MONITORING AND MANAGEMENT ACTIVITIES

In 1999, the NPS established a long-term hemlock forest monitoring program (Perez, 2005). Thirty-six 400m² sampling plots were selected in GARI and NERI hemlock stands. No plots were established at BLUE due to logistical constraints. The objective of the study was to gather information on hemlock health, HWA infestation levels, biodiversity, and rare, threatened and endangered species.

HWA was first detected within the park boundaries along the Bluestone River in 2000 (Perez, 2000). By 2005, HWA was found in 8 of the 36 monitoring plots (22%) at NERI and GARI. Trees along the Bluestone River have been infested the longest, and now are exhibiting declining tree health.

In March 2003, NPS personnel treated 33 trees at Grandview using a soil injection of imidacloprid (Merit®).

METHODS

Live hemlock trees (> 6" DBH) were randomly selected for inspection within the survey areas based on accessibility into the selected stands. An assessment of tree vigor, branch tip dieback, new shoot growth, DBH (estimated tree diameter at breast height to nearest inch), HWA population densities and HWA mortality estimates was conducted of each tree.

A GPS (global positioning system) unit was used to collect coordinates (decimal degrees, WGS84) to track the area surveyed within the stands. A GPS point was taken to represent the general area of each plot. The number of trees per plot varied based on the availability of hemlock trees with branches that could be reached.

Up to four branch samples, each 30 centimeters in length, were selected from the lower crown from different sides of the tree. HWA infestation density levels were designated as heavy, moderate, light or none based on the percentage of tips with adelgid present and categorized as follows:

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Heavy (H) = (>50% infested)

Moderate (M) = (50% to 25% infested)

Light (L) = (<25% infested)

None (N) = (0% infested)
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Vigor ratings represent the general health of the tree based on:

Healthy (H) = tree appears to be in reasonably good health: less than 10% branch or twig mortality, discoloration, or dwarfed leaves present

Light Decline (LD) = branch mortality, twig dieback, foliage discoloration, or dwarfed leaves present on 10-25% of the crown

Moderate Decline (MD) = branch morality, twig dieback, foliage discoloration or dwarfed leaves on 26-50% of crown

Severe Decline (SD) = more than 50% of the crown with branch mortality, dieback, discoloration or leaf dwarfing, but foliage still present indicating that the tree is alive

Relative abundance of new growth and shoot tip dieback was estimated by assessment of each shoot tip within 30 centimeters of branch length, divided by the total number of tips on each branch sample.

An assessment of HWA mortality was visually estimated based on abundance of under developed nymphs relative to those that had developed larger woolly masses.

RESULTS

Areas surveyed are represented in Figures 1-4 and the survey data is presented in Appendix A. A summary of the results are provided in Table 1. Hemlock woolly adelgid infestations and tree health ratings are variable from stand to stand and even tree to tree throughout the survey area. Estimated HWA mortality generally ranged between 51-90 % throughout the parks.

A total of seven areas were surveyed including portions of the Bluestone River at BLUE, Hedricks Creek at GARI, and Fern Creek, Glade Creek, Grandview, Kates Branch, and Wolf Creek at NERI. A total of 37 plots were established which included 282 trees and a total of 795 branch samples.

At BLUE, a total of 8 plots was established with 40 trees and 108 branches evaluated. HWA populations are generally at moderate densities, ranging from light to heavy. Trees are generally in moderate decline, but ranged from light to severe decline.

At Hedricks Creek (GARI), a total of 5 plots were established with 45 trees and 110 branches evaluated. The average HWA infestation level was light and ranged from none to heavy. Trees are generally healthy, ranging from healthy to light decline.

At Fern Creek (NERI), a total of 11 plots were established with 54 trees and 146 branches evaluated. The average HWA population density was light, ranging from none to moderate. Trees are generally healthy, with a few trees with light to moderate decline. There were a few individual hemlock trees with higher HWA population levels located near the parking lots.

At Glade Creek (NERI), a total of 6 plots were established with 25 trees and 52 branches evaluated. The HWA infestation level was light, ranging from none to heavy. Tree health ranged from healthy to moderate decline.

At Grandview (NERI), a total of 8 plots were established with 50 trees and 164 branches evaluated. The average HWA population density for the entire survey area was light, ranging from none to heavy. Tree health for ranged from healthy to moderate decline. Plot 20 was located at Turkey Spur Overlook, and plots 21-22 were established along the road out to Turkey Spur Overlook. Plots 36-40 were established in the main overlook area. The lowest HWA population densities were at plots 38-40, where trees received treatment in March 2003.

At Kates Branch (NERI), a total of 3 plots were established with 31 trees and 106 branches evaluated. The HWA infestation level was light, ranging from none to light. Trees were generally healthy, with a few trees in light decline.

At Wolf Creek (NERI), a total of 7 plots were established with 37 trees and 109 branches evaluated. Plot 32 was located at the Kaymoor Trailhead parking lot on Fayette Station Road. The HWA population densities were heavy at this location. Hemlock trees were scattered along the creek, making

surveying difficult. The trees are generally healthy. The rest of the plots were located in upper Wolf Creek. HWA was found on only one tree and it was a light infestation. Trees are healthy in this section of Wolf Creek.

DISCUSSION

Tree health and HWA population densities are highly variable within all three Parks. Most hemlocks were found to be in good health, with the exception of BLUE. Although HWA densities are highly variable, infestations are present in all the survey areas.

Hemlock trees at BLUE have declined since the first occurrence of HWA in 2000. Most of the trees have produced some new growth this past season, however it is very stunted. This slight recovery will likely be short-lived as HWA populations remain prevalent.

Without intervention, impacts to hemlock resources throughout the three Parks will likely increase as HWA spreads throughout the region. Most hemlocks will disappear from the forest ecosystem and replaced by early successional hardwood species. Surviving hemlocks may linger in a severe state of decline for a number of years but will eventually succumb to other stressors such as drought or other insect or disease attacks.

Management Options

Chemical management options for preserving hemlock stands are limited by the biology and feeding behavior of HWA, pest population densities, site conditions (i.e. proximity to streams), accessibility and limited application technology currently available. Insecticide treatments although effective, are conducted on an individual tree basis which can be both labor intensive and costly. Thus treatment strategies are typically focused in high value sites such as recreational or scenic areas or where hemlock stands are known to play an important ecological role. Classical biological controls such as predators and pathogens are being pursued by the USDA Forest Service but will likely take years to become effectively established. As such, preservation of hemlocks in the short term will require intensive monitoring and periodic chemical treatments when infestations are discovered.

Foliar chemical treatments. Aerial spray using horticultural oil or insecticidal soap is not an option because aerial sprays could not provide the needed "saturation" necessary to ensure that the insecticide adequately covers the insect. Aerial spraying with more toxic insecticides (e.g. malathion or diazinon) would have very significant, unacceptable impacts on a wide range of non-target insects and other animals and limited control benefits (Evans 2000). Application of insecticides using ground spraying equipment is generally limited to areas accessible to hydraulic spray equipment and areas where over spray or run off would not contaminate streams, lakes or ponds. Backpack sprayers could be effectively used for foliar treatment of infested seedlings and saplings in more remote areas.

Systemic Insecticides. Several systemic insecticides are labeled for adelgids and can be injected (e.g. imidacloprid, bidrin or Metasystox-R[®]) or implanted (e.g. acephate) into hemlock trees, and another (Merit[®]) can be applied as a soil drench or injected into to the soil around hemlock trees. These insecticides are absorbed and trans-located by the vascular system of the tree to feeding adelgids and will effectively suppress HWA populations (Doccola et al. 2003, Webb et al. 2003, Evans 2000, Steward and Horner 1994, McClure 1992a). Soil injection in sandy or saturated soils should be avoided as leaching of the insecticide into the soil profile and groundwater (McAvoy et al. 2002) is a possibility. Soil injections immediately adjacent to creeks or other open waters should also be avoided.

Imidacloprid formulated as a trunk injection is available under the trade names Pointer®, IMA-jet® and Imicide® and are labeled for tree injection for the control of adelgids. However, only IMA-jet® and Imicide® are labeled for applications in the forest environment. Both stem and soil treatments of imidacloprid have become the preferred treatment for HWA in high value hemlock stands by state and federal resource managers. A further discussion of this product follows.

Imidacloprid is a relatively new insecticide in the family of chemicals called neonicotinoids (Felsot 2001) in the chloronicotinyl subgroup (USDA Animal and Plant Health Inspection Service 2002). It has a mode of action similar to that of the botanical product nicotine, functioning as a fast-acting insect neurotoxicant (Schroeder and Flattum 1984) that binds to the nicotinergic receptor sites in the postsynaptic membrane of the insect nerve (USDA Animal and Plant Health Inspection Service 2002), mimicking the action of acetylcholine, and thereby heightening, then blocking, the firing of the postsynaptic receptors with increasing doses (Schroeder and Flattum 1984, Felsot 2001). Because imidacloprid is slowly degraded in the insect, it causes substantial disorder within the nervous system, leading in most cases to death (Mullins 1993, Smith and Krischik 1999).

Imidacloprid is considered to have low to moderate mammalian toxicity (Mullins 1993), largely because it does not bind nerve receptors in mammals sufficiently to trigger nervous activity (Felsot 2001). The selective toxicity of imidacloprid is perhaps best illustrated by its use in flea treatments approved for cats and dogs. Advantage® is applied directly to the animal's skin; this preparation carries very little, if any, risk to the animal or to the people, including children, who may handle the animal (USDA Animal and Plant Health Inspection Service 2002). Chronic (repeated dose) toxicity studies have demonstrated that imidacloprid is not carcinogenic and is not mutagenic and demonstrates no primary reproductive toxicity (Mullins 1993). In studies of metabolic fate in rats, imidacloprid was rapidly absorbed and eliminated in the excreta (90 percent of the dose within 24 hours) with little bioaccumulation (0.5 percent of the dose after 48 hours) and no biologically significant differences occurring between sexes, dose level, and route of administration (USDA Animal and Plant Health Inspection Service 2002). Imidacloprid is an insecticide exhibiting both systemic and contact activity. The spectrum of activity primarily includes sucking insects (aphids, whiteflies, leaf and plant hoppers, thrips, plant bugs, and scales), many Coleopteran species, and selected species of Diptera and Lepidoptera. Activity has also been demonstrated for ants (Hymenoptera); termites (Isoptera); and cockroaches, grasshoppers, and crickets (Orthoptera). No activity has been demonstrated against nematodes or spider mites (Mullins 1993). In spider mites, imidacloprid has been demonstrated to cause an egg-laying enhancement (James and Price 2002). Since spider mites can be a problem in ornamental hemlocks, open-grown imidacloprid-treated trees should be carefully monitored for increases in mite populations.

Little is known about the biotransformation and bioactivity of the metabolites of imidacloprid in hemlock. What is known is that trunk-injected imidacloprid generally requires a week or longer to provide adelgid control, with protection lasting for up to 2 years (Tater et al. 1998, Silcox 2002). The soil injection or soil drench methods of imidacloprid treatments take several months for translocation to occur but typically has provided better consistency in treatment efficacy when compared to stem injections. Stem injections should not be used on severely stressed trees.

Biological control: There are no known parasites of adelgids. The first predator beetle to be imported and released for biological control is a tiny, black lady beetle, *Sasajiscymnus tsugae* (S.t), from Japan. So far, over a million S.t beetles have been released in over 200 sites in 15 eastern states from Georgia to Maine. Several species of Scymnus lady beetles from China and a derodontid beetle Laricobius nigrinus from the Pacific Northwest are also approved for release. Establishment of the latter predators began in

2004. It is likely that a complex of natural enemies will be necessary to maintain HWA below damaging levels and it will likely take years to be successful.

Establishment of predator beetles of HWA requires a viable and healthy population of adelgids, which ironically is associated with healthy hemlocks. These predators are not expected to have an immediate effect on HWA populations at the stand level but are expected to provide longer term control as part of a self perpetuating natural enemy complex. Release of predator beetles should not take place in close proximity of hemlock trees that have received chemical treatments because of the effect of the chemical insecticide may have on beetles should they feed on adelgids that ingest the insecticide. Preferred release sites are newly infested sites where trees and adelgids are still healthy. Predator beetles are laboratory reared and the number of predators available in any given year is variable depending in part, on the success of the rearing facilities to locate good quality host material for a food source. Artificial diets are not yet available.

RECOMMENDATIONS

Imidacloprid based insecticides is recommended on accessible high-value infested hemlock trees throughout the park complex. The release and establishment of *Sasajiscymnus tsugae*, *Scymnus sinuanodulus*, and *Laricobius nigrinus* predatory beetles, is also recommended in lightly infested areas of the park on healthy hemlocks that will not be chemically treated. Resource managers should prioritize treatment sites and individual trees based on the relative ecological or recreational significance and/or visual importance. It will not be plausible to treat all hemlock stands nor in most cases, all of the hemlocks within the selected stands.

Where possible, soil injections are preferred over stem injections as treatment efficacy has been shown to be more consistent and associated costs are often less than 30 percent of the cost of stem injection treatments. Merit[®] applied at 0.75 grams a.i. per inch of trunk diameter (dbh) is recommended for the soil injections, and treatment timing should be in the spring or fall. The insecticide recommended for the stem injections is IMA-jet[®] at 5% active ingredient with the application rate also determined by dbh. Imidacloprid treated trees should be marked in a manner that will identify the year they were treated such as a basal spray of color coded paint or tags since these treatments should provide at least 2 years of control and treatments on neighboring trees in subsequent years may be desirable. Foliage ground spraying using hydraulic sprayers is only feasible in areas located away from streams, and in areas with road access, such as Grandview. Ground spraying using horticultural oil to protect hemlock seedlings and saplings by means of a backpack sprayer should be considered in areas where protecting younger hemlocks is desirable. A 2% solution of horticultural oil applied in early summer or after buds have hardened off in early fall is recommended as adelgids have not yet developed the wool covering that can impede penetration of the insecticide.

Predatory beetles are best released in areas where HWA population densities are light and trees are healthy to give these natural enemies the best chance to establish and build in numbers that can control building adelgid populations before trees begin to decline. Releases take place in the spring or fall of the year when HWA are actively feeding. Monitoring and evaluation efforts will be conducted by USDA Forest Service personnel for the purpose of documenting the establishment and dispersal of the beetle and evaluating the effectiveness in reducing HWA population densities and protecting hemlock health.

Hopefully, the establishment of these natural enemies will provide long range control and minimize the need for repeated chemical treatments in future years. In the interim, resource managers should prepare a management plan that identifies and prioritizes high value hemlock resources and outlines a

monitoring and treatment strategy. Effective control is plausible in limited areas but will require diligent monitoring of adelgid populations and the application of chemical treatments when needed until sufficient natural enemy populations become established.

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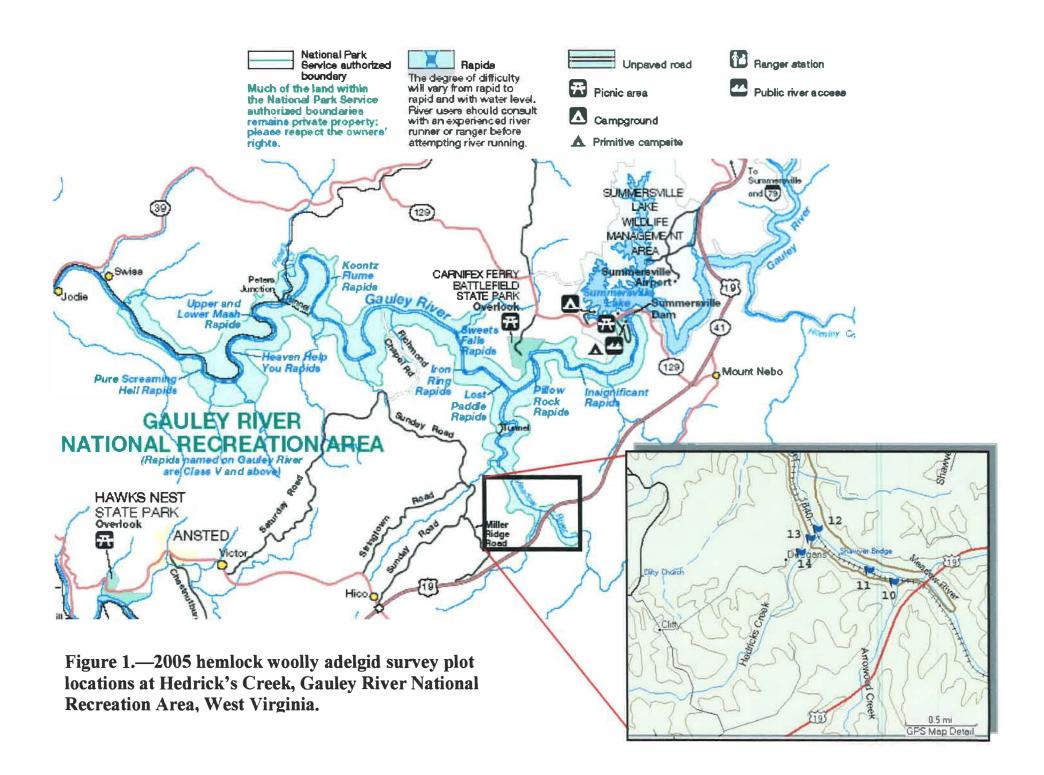
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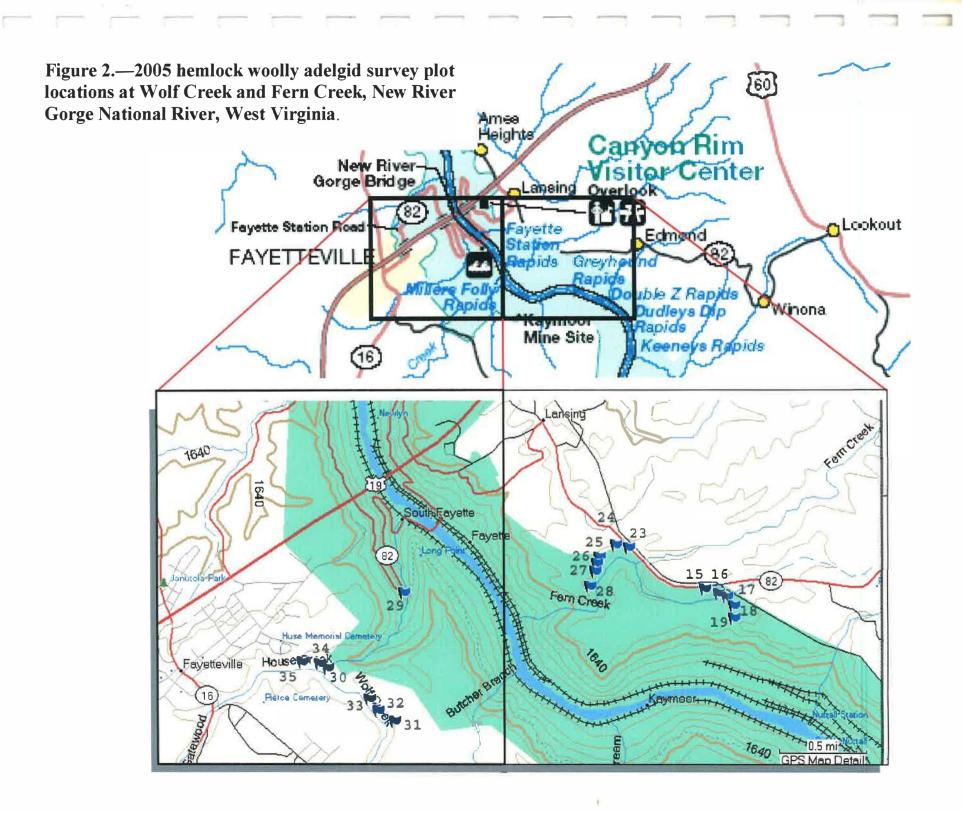
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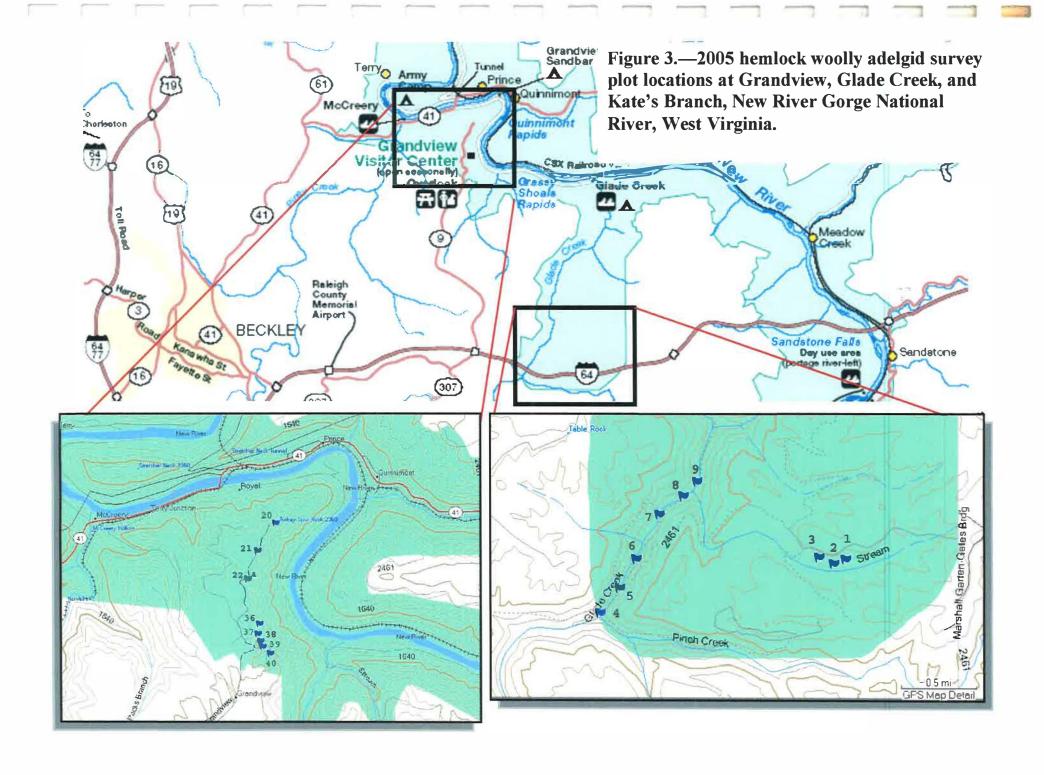
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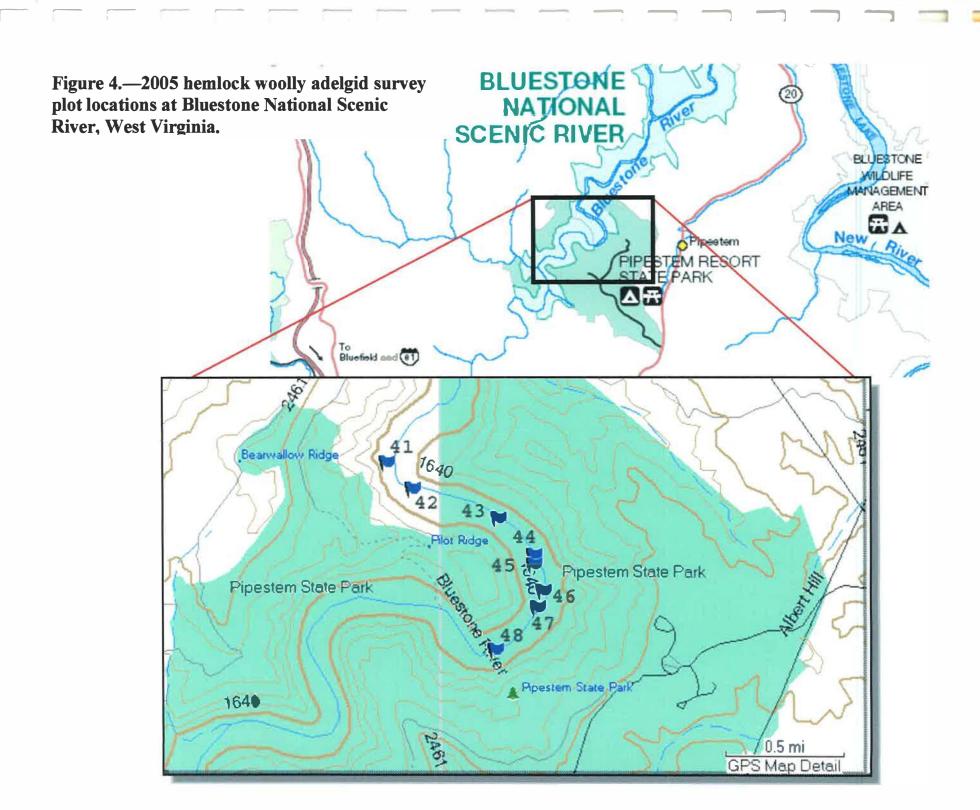
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Appendix A: Hemlock woolly adelgid survey data collected in June 2005 at the New River Gorge National River, the Gauley River National Recreation Area and the Bluestone National Scenic River, West Virginia.

Sile	Location Name	PlotID	Plot#	Charles and a control of the control	Prev HWA Density Est	DBH	Vigor	Branchlo	Percent Tip Dead	Percent Tip New	Branch HWA Percent	Tree HWA Avg Persent	Tree HWA Avg Density	HWA Moltality Est
BNSR	Bluestone National Scenic River	61	41		>50%	14	MD	1163	3.17	39.68	96.83	47.99 M		<50%
BNSR	Bluestone National Scenic River	61	41	256 H	l>50%	12	MD	1176	0.00	100.00	39.39	58.24 H		<50%
BNSR	Bluestone National Scenic River	61	41	252 H	l>50%	14	MD	1164	0.00	92.86	25.71	47.99 M		<50%
BNSR	Bluestone National Scenic River	61	41	252 H	l>50%	14	MD	1165	7.14	87.50	21.43	47.99 M		<50%
BNSR	Bluestone National Scenic River	61	41	253 H	>50%	12	MD	1167	0.00	71.05	26.32	56.69 H		<50%
BNSR	Bluestone National Scenic River	61	41	253 H	l>50%	12	MD	1166	0.00	55.17	100.00	56.69 H		<50%
BNSR	Bluestone National Scenic River	61	41	253 H	l>50%	12	MD	1168	0.00	56.25	43.75	56.69 H	-	<50%
BNSR	Bluestone National Scenic River	61	41	254 H	l>50%	10	SD	1170	6.56	63.93	50.82	56.99 H		<50%
BNSR	Bluestone National Scenic River	61	41	254 H	l>50%	10	SD	1169	36.84	42.11	63.16	56.99 H		<50%
BNSR	Bluestone National Scenic River	61	41	and the second s	I>50%	18	MD	1171	0.00	93.55	45.16	48.16 M		<50%
BNSR	Bluestone National Scenic River	61	41	255 H	l>50%	18	MD	1172	1.23	96.30	96.30	48.16 M		<50%
BNSR	Bluestone National Scenic River	61	41		>50%	18	MD	1173	7.04	90.14	16.90	48.16 M		<50%
BNSR	Bluestone National Scenic River	61	41		l>50%	12	MD	1175	21.15	78.85	82.69	58.24 H		<50%
BNSR	Bluestone National Scenic River	61			l>50%	12	MD	1177	0.00	100.00	52.63	58.24 H		<50%
BNSR	Bluestone National Scenic River	61	- 1	-	1>50%	18	MD	1174	5.71	91.43	34.29	48.16 M		<50%
BNSR	Bluestone National Scenic River	62			=<25%	6	LD	1179	0.00	4.69	10.94	8.72 L		51-90%
BNSR	Bluestone National Scenic River	62			=<25%	6	LD	1180	0.00	12.90	9.68	8.72 L		51-90%
BNSR	Bluestone National Scenic River	62		The second section is	=<25%	6	LD	1178	3.70	14.81	5.56	8.72 L		51-90%
BNSR	Bluestone National Scenic River	62	1		1=25-50%	10	MD	1182	0.00	100.00	18.18	19.60 L		51-90%
BNSR	Bluestone National Scenic River	62			1=25-50%	10	MD	1183	0.00	43.75	3.13	19.60 L		51-90%
BNSR	Bluestone National Scenic River	62			1=25-50%	10	MD	1181	0.00	12.50	37.50	19.60 L		51-90%
BNSR	Bluestone National Scenic River	62			1>50%	20	SD	1184	42.37	11.86	55.93	32.84 M		<50%
BNSR	Bluestone National Scenic River	62			>50%	20	SD	1185	58.54	0.00	9.76	32.84.M		<50%
BNSR	Bluestone National Scenic River	63			=<25%	3	LD	1192	0.00	79.41	2.94	7.30 L		51-90%
BNSR	Bluestone National Scenic River	63			=<25%	3	LD	1193	0.00	83.33	11.67	7.30 L		51-90%
BNSR	Bluestone National Scenic River	63			1=25-50%	2	LD	1194	0.00	100.00	30.00	19.69 L		N/A
BNSR	Bluestone National Scenic River	63	1		A=25-50%	2	LD	1195	0.00	12.50	9.38	19.69 L		51-90%
BNSR	Bluestone National Scenic River	63			=<25%	8	LD	1196	15.52	0.00	0.00	18.92 ^t L		<50%
BNSR	Bluestone National Scenic River	63		the second second second	=<25%	8	LD	1197	10.53	12.28	26.32	18.92 L		<50%
BNSR	Bluestone National Scenic River	63			=<25%	8	LD	1198	0.00	21.74	30.43	18.92 L	17.5	<50%
BNSR	Bluestone National Scenic River	63			1>50%	5	LD	1191	0.00	87.50	55.00	49.52 M		<50%
BNSR	Bluestone National Scenic River	63			1>50%	5	LD	1189	0.00	58.06	64.52	49.52 M		<50%
BNSR	Bluestone National Scenic River	63			1>50%	5	LD	1190	0.00	100.00	29.03	49.52 M		<50%
BNSR	Bluestone National Scenic River	63	1	The second secon	Λ=25-50%	3	LD	1186	0.00	35.71	100.00	54.89 H		51-90%
BNSR	Bluestone National Scenic River	63			1=25-50%	3	LD	1187	0.00	100.00	16.67	54.89 H		51-90%
BNSR	Bluestone National Scenic River	63	-		1=25-50%	3	LD	1188	0.00	100.00	48.00	54.89 H		51-90%
BNSR	Bluestone National Scenic River	64		the second secon	=<25%	4	LD	1203	0.00	100.00	3.51	8.08 L		>90%
BNSR	Bluestone National Scenic River	64			A=25-50%	18	SD	1201	12.50	23.21	17.86	17.45 L		51-90%
BNSR	Bluestone National Scenic River	64			/=25-50%	18	SD	1199	10.53	34.21	21.05	17.45 L		51-90%
BNSR	Bluestone National Scenic River	64			/=25-50%	18	SD	1200	2.99	29.85	13.43	17.45 L		51-90%
BNSR	Bluestone National Scenic River	64			=<25%	4	LD	1202		75.56	2.22	8.08 L		>90%
BNSR	Bluestone National Scenic River	64			=<25%	8	MD	1205	12.82	34.62	3.85	21.41 L		51-90%
BNSR	Bluestone National Scenic River	64			=<25%	8	MD	1206	0.00	96.88	28.13	21.41 L		51-90%
BNSR	Bluestone National Scenic River	64			=<25%	8	MD	1207	0.00	90.32	32.26	21.41 L		51-90%
BNSR	Bluestone National Scenic River	64			=<25%	5	MD	1208	3.13	62.50	9.38	15.66 L		51-90%
BNSR	Bluestone National Scenic River	64			=<25%	5	MD	1209	3.23	83.87	29.03	15.66 L		51-90%
BNSR	Bluestone National Scenic River	64	1	- NIII	.=<25%	5	MD	1210	21.21	45.45	12.12	15.66 L		
BNSR	Bluestone National Scenic River	64	4		=<25%	5	MD	1211	0.00	84.85	12.12	15.66 L		51-90% 51-90%

Site	Location Name	PtotID	Plot #	TreeID Density Est	DBH	Vigo	BranchiD	Percent Tip Dead	Percent Tip New	Branch HWA Percent	Tree HWA	Tree HWA Avy Density	HWA Mortality Est
BNSR	Bluestone National Scenic River	64	44	269 L=<25%	20	SD	1213	39.47	73.68	18.42	17.37 L	3	<50%
BNSR	Bluestone National Scenic River	64	44	269 L=<25%	20	SD	1212	36.73	48.98	16,33	17.37 L		<50%
BNSR	Bluestone National Scenic River	64	44	266 L=<25%	4	LD	1204	0.00	74.07	18.52	8.08 L		>90%
BNSR	Bluestone National Scenic River	65	45	270 L=<25%	6	MD	1216	0.00	92.54	7.46	20.38 L		<50%
BNSR	Bluestone National Scenic River	65	45	270 L=<25%	6	MD	1214	0.00	100.00	44.12	20.38 L		<50%
BNSR	Bluestone National Scenic River	65	45	270 L=<25%	16	MD	1215	0.00	82.69	19.23	20.38 L		<50%
BNSR	Bluestone National Scenic River	65	45	270: L=<25%	6	MD	1217	0.00	100.00	10.71	20.38 L		<50%
BNSR	Bluestone National Scenic River	65	45	271 M=25-50%	10	MD	1220	16.67	0.00	63.89	28.84 M		51-90%
BNSR	Bluestone National Scenic River	65	45	271 M=25-50%	10	MD	1218	3.33	93.33	0.00	28.84 M		51-90%
BNSR	Bluestone National Scenic River	65	45	271 M=25-50%	10	MD	1219	11.32	41.51	22.64	28.84 M		51-90%
BNSR	Bluestone National Scenic River	65	45	272 M=25-50%	10	SD	1222	17.95	0.00	30.77	53.27 H		51-90%
BNSR	Bluestone National Scenic River	65	45	272 M=25-50%	10	SD	1223	21.21	3.03	69.70	53.27 H		51-90%
BNSR	Bluestone National Scenic River	65	45	272 M=25-50%	10	SD	1221	4.08	14.29	73.47	53.27 H		51-90%
BNSR	Bluestone National Scenic River	65	45	272 M=25-50%	10	SD	1224	26.09	17.39	39.13	53.27 H		51-90%
BNSR	Bluestone National Scenic River	65	45	273 M=25-50%	112	SD	1225	10.81	16.22	51.35	35.20: M		<50%
BNSR	Bluestone National Scenic River	65	45	273 M=25-50%	12	SD	1226	33.33	11.11	30.56	35.20 M		<50%
BNSR	Bluestone National Scenic River	65	45	273 M=25-50%	12	SD	1227	18.4	10.53	23.68	35.20 M		N/A
BNSR	Bluestone National Scenic River	65	45	274 M=25-50%	14	MD	1228		4.00	48.00	37.27 M		51-90%
BNSR	Bluestone National Scenic River	65	45	274 M=25-50%	14	MD	1229	43.86	7.02	5.26	37.27 M		51-90%
BNSR	Bluestone National Scenic River	65		274 M=25-50%	14	MD	1230	7.32	56.10	58.54	37.27 M		51-90%
BNSR	Bluestone National Scenic River	65	45	275 H>50%	16	SD	1233	2.94	98.53	30.88	66.11 H		51-90%
BNSR	Bluestone National Scenic River	65	45	277 M=25-50%	14	SD	1238	22.45	8.16	24.49	35.93 M		<50%
BNSR	Bluestone National Scenic River	65	45	277 M=25-50%	14	SD	1237	26.32	28.95	47.37	35.93 M		<50%
BNSR	Bluestone National Scenic River	65		276 M=25-50%	16	SD	1236	28.89	0.00	31.11	45.40 M		51-90%
BNSR	Bluestone National Scenic River	65		276 M=25-50%	16	SD	1234	ACCORDING TO MANAGEMENT OF THE PARTY OF THE	2.86	82.86	45.40 M		>90%
BNSR	Bluestone National Scenic River	65		275 H>50%	16	SD	1232	the same and the same of the s	0.00	92.45	66.11 H		51-90%
BNSR	Bluestone National Scenic River	65		275 H>50%	16	SD	1231	0.00	0.00	75.00	66.11 H		51-90%
BNSR	Bluestone National Scenic River	65		276 M=25-50%	16	SD	1235	the state of the s	0.00	22.22	45,40 M		51-90%
BNSR	Bluestone National Scenic River	66		280 M=25-50%	3	SD	1244		0.00	48.48	47.16 M		51-90%
BNSR	Bluestone National Scenic River	66		281 H>50%	6	MD	1246	-	0,00	76.47	60.46 H		51-90%
BNSR	Bluestone National Scenic River	66	46	281 H>50%	6	MD	1247	4.44	0.00	44.44	60.46 H		51-90%
BNSR	Bluestone National Scenic River	66	-	282 H>50%	8	MD	1248		62.50	100.00	70.00 H		<50%
BNSR	Bluestone National Scenic River	66	46	282 H>50%	8	MD	1249		33.33	50.00	70.00 H		<50%
BNSR	Bluestone National Scenic River	66		282 H>50%	8	MD	1250	10.00	13.33	60.00	70.00 H		<50%
BNSR	Bluestone National Scenic River	66	46	283 H>50%	16	MD	1251	0.00	19.05	95.24	78,30 H		<50%
BNSR	Bluestone National Scenic River	66	46	283 H>50%	16	MD	1252	4.55	97.73	61.36	78.30(H		<50%
BNSR	Bluestone National Scenic River	66	46	280·M=25-50%	3	SD	1245	10.42	0.00	45.83	47.16 M		51-90%
BNSR	Bluestone National Scenic River	66	46	279 H>50%	14	MD	1241	10.45	58.21	14.93	33.14 M		<50%
BNSR	Bluestone National Scenic River	66	46	278 M=25-50%	6	MD	1240	26.67	51.11	46.67	34.05 M		51-90%
BNSR	Bluestone National Scenic River	66	46	279 H>50%	14	MD	1242	38.67	61.33	21.33	33.14 M		<50%
BNSR	Bluestone National Scenic River	66		278 M=25-50%	6	MD	1239		58.93	21.43	34.05 M		51-90%
BNSR	Bluestone National Scenic River	66	46	279 H>50%	14	MD	1243	42.11	21.05	63.16	33.14 M		<50%
BNSR	Bluestone National Scenic River	67		287 H>50%	8	MD	1261	19.67	70,49	39.34	45.99 M		<50%
BNSR	Bluestone National Scenic River	67		284 L=<25%	10	LD	1254	12.00	20.00	32.00	30.47 M		51-90%
BNSR	Bluestone National Scenic River	67	-	284 L=<25%	10	LD	1255		25.00	40.00	30.47 M		51-90%
BNSR	Bluestone National Scenic River	67		285 M=25-50%	10	SD	1256	the state of the s	6.98	27.91	37.29 M		51-90%
BNSR	Bluestone National Scenic River	67		286 M=25-50%	12	MD	1259		38.71	32.26	27.16 M		51-90%
BNSR	Bluestone National Scenic River	67		284 L=<25%	10	LD	1253		26.87	19.40	30.47 M		51-90%
BNSR	Bluestone National Scenic River	67		287 H>50%	8	MD	1260	2.63	86.84	52.63	45.99 M		<50%
BNSR	Bluestone National Scenic River	67		288 M=25-50%	14	LD	12 64	-	56.52	41.30	23.29 L		<50%
BNSR	Bluestone National Scenic River	67		288 M=25-50%	14	LD	1262	the second section is	93.83	13.58	23.29'L		<50%
BNSR	Bluestone National Scenic River	67		288 M=25-50%	14	LD	1263		97.50	15.00	23.29 L		<50%
BNSR	Bluestone National Scenic River	67			12	MD	1258		73.53	22.06	27.16 M		51-90%

Site	Location Name	Ploud	Plot#	Prev HWA TrealD Density Est		Vico	The second second	Percent Tip Dead	Percent Tip New	Branch HWA	Tree HWA Ava Percent	Avg Density	Mortality Est
BNSR	Bluestone National Scenic River	67	47	285 M=25-50%	10	SD	1257	53.33	0.00	46.67	37.29 M		51-90%
BNSR	Bluestone National Scenic River	68	48	291 M=25-50%	8	SD	1270	8.89	88.89	51.11	56.67 H		51-90%
BNSR	Bluestone National Scenic River	68	48	289 H>50%	8	SD	1265	16.39	42.62	52.46	44.16 M		51-90%
BNSR	Bluestone National Scenic River	68	48	289 H>50%	8	SD	1266	0.00	95.65	35.87	44.16 M		51-90%
BNSR	Bluestone National Scenic River	68	48	290 H>50%	8	SD	1267	14.46	97.59	28.92	39.46 M		51-90%
BNSR	Bluestone National Scenic River	68	48	290 H>50%	8	SD	1268	8.33	55.56	50.00	39.46 M		51-90%
BNSR	Bluestone National Scenic River	68	48.	291 M=25-50%	8	SD	1269	4.44	73.33	62.22	56.67 H		<50%
GRNRA	Hedrick's Creek	39	10	132 None	7	LD	867	0.00	75.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	137 None	8	Н	879	0.00	67.19	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	137 None	8	H	880	0.00	50.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	136 None	10	Н	878	0.00	92.45	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	136 None	10	Н	877	3.77	62.26	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	135 None	10	Н	874	0.00	94.29	0.00	0.00 N		N/A
GRNRA	Hedrick'sCreek	39	10	135 None	10	Н	875	28.57	88.57	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39!	10	134 None	12	Н	872	27.50	35.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	134 None	12	Н	873	6.41	43.59	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	133 None	12	Н	868	3.57	71.43	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	133 None	12	Н	869	37.50	16.67	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	133 None	12	Н	870	5.88	50.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	128 None	10	Н	856	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick' sCreek	39	10	132 None	7	LD	866	0.00	90.91	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	138 L=<25%	8	Н	882	0.00	95.65	0.00	9.21 L		N/A
GRNRA	Hedrick's Creek	39	10	131 None	10	H	863	8.33	91.67	0.00	0.00 ^s N		N/A
GRNRA	Hedrick's Creek	39	10	131 None	10	H	864	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	130 None	6	Н	862	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	130 None	6	H	861	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	129 None	6	Н	858	9.62	88.46	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	129 None	6	H	859	1.89	98.11	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	129 None	6	Н	860	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	128 None	10	H	857	2.78	97.22	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	128 None	10	H	855	0.00	23.81	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	135 None	10	Н	876	0.00	88.10	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	132 None	7	LD	865	3.23	90.32	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	137 None	8	H	881	0.00	87.88	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	138 L=<25%	8	H	883	0.00	92.11	18.42	9.21 L		51-90%
GRNRA	Hedrick's Creek	39	10	139 None	6	Н	884	4.41	86.76	0.00	0.00 N		N/A
GIRNRA	Hedrick's Creek	39	10	139 None	6	Н	885	7.89	89.47	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	139:None	6	Н	886	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	39	10	134 None	12	H	871	1.56	79.69	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	152 None	12	Н	928	0.00	78.00	2.00	1.01 L		N/A
GRNRA	Hedrick's Creek	40	11	152! None	12	Н	929	0.00	77.78	0.00	1.01 L		N/A
GRNRA	Hedrick's Creek	40	11	152 None	12	Н	927	0.00	67.35	2.04	1.01 L		51-90%
GRNRA	Hedrick's Creek	40	11	146 H>50%	6	LD	911	0.00	94.44	11.11	61.01 H		N/A
GRNRA	Hedrick's Creek	40	11	152 None	12	Н	926	0.00	97.37	0.00	1.01 L		N/A
GRNRA	Hedrick's Creek	40	11	151 None	12	Н	925	5.41	64.86	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	149 L=<25%	12	Н	917	0.00	43.40	1.89	4.91 L		N/A
GRNRA	Hedrick's Creek	40	11	151!None	12	Н	924	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	151 None	12	Н	923	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	151 None	12	Н	922	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	150 None	10	Н	920	0.00	98.28	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	150! None	10	Н	919	0.00	71.05	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	147 None	6	H	914	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	149(L=<25%	12	Н	918	3.17	28.57	7.94	4.91 L		51-90%

Site	Location Name	PlotID	Plot#	CONTRACTOR OF THE PARTY OF THE	Prev HWA Density Est	рвн	Vigor	BranchiD	Percent Tip Dead	Percent Tip New	Branch HWA Percent	Tree HWA	Tree HWA Y	HWA Mortality Est
GRNRA	Hedrick's Creek	40		148 L=		12	Н	916	0.00	42.86	4.76	2.38 L		51-90%
GRNRA	Hedrick's Creek	40.		148 L=	=<25%		Н	915	5.56	22.22	0.00	2.38 L		N/A
GRNRA	Hedrick's Creek	40		147 No	one	6	Н	912	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		147 No	one	6	Н	913	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hêdrick's Creek	40		150 No	one	10	Н	921	0.00	88,24	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		146 H	- autoria	6	LD	910	0.00	6.06	39.39	61.01 H		N/A
GRNRA	Hedrick's Creek	40		142 No	one	6	Н	895	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		146 H	>50%	6	LD	908	0.00	6.45	93.55	61.01 H		N/ A
GRNRA	Hedrick's Creek	40		145/L=	<25%	12	Н	907	8.11	13.51	0.00	0.63 L		N/A
GRNRA	Hedrick's Creek	40		145 L=	=<25%	12	Н	905	1.89	7.55	1.89	0.63 L		51-90%
GRNRA	Hedrick's Creek	40		145 L=	=<25%	12	Н	906	0.00	24.53	0.00	0.63 L		N/A
GRNRA	Hedrick's Creek	40	11	144 N	one	12	Н	902	0.00	100.00	0.00	0.00 N		N/ A
GRNRA	Hedrick's Creek	40		144 N		12	Н	903	0.00	75.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	11	144 N	one	12	Н	904	7.14	89.29	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		143 N		6	Н	901	5.26	94.74	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40	-	143 No		6	Н	899		96.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		143 No		6	H	900		100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		142 N		6	Н	898		100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		142 No		6	Н	896		97.78	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		141 N		6	Н	892			0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		141 N		6	Н	894		100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40		141 N		6	Н	893		98.15	0.00	0.00 N		N/ A
GRNRA	Hedrick's Creek	40		141 N		6	Н	891	0.00	100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	40			=<25%	6	Н	887	5.71	94.29	0.00	0.38 L		N/A
GRNRA	Hedrick's Creek	40			=<25%	6	Н	888		73.85	1.54	0.38 L		51-90%
GRNRA	Hedrick's Creek	40			=<25%	6	H	889		100.00	0.00	0.38 L		N/ A
GRNRA	Hedrick's Creek	40		2.	=<25%	6	Н	890		97.50	0.00	0.38 L		NA
GRNRA	Hedrick's Creek	40				6	LD	909	Contraction (Co.)	15.63	100.00	61.01 H		NA
GRNRA	Hedrick's Creek	40				6	Н	897		100.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	41				12	LD	930		0.00	100.00	98.41 H		N/A
GRNRA	Hedrick's Creek	41			=<25%	12	Н	935			6.25	6.25 L		51-90%
GRNRA	Hedrick's Creek	41				12	LD	932		the same of the sa	95.24	98.41 H		N/ A
GRNRA	Hedrick's Creek	41			I=25-50%	6	Н	933	I make the second of the second	11.39	13.92	13.92 L		51-90%
GRNRA	Hedrick's Creek	41				6	LD	934		56.00	0.00	0.00 N		N/ A
GRNRA	Hedrick's Creek	41	-			12	LD	931	0.00	0.00	100.00	98.41 H		51-90%
GRNRA	Hedrick's Creek	41		-	=<25%	10	Н	937		85.37	7.32	14.12 L		51-90%
GRNRA	Hedrick's Creek	41	-		=<25%	10	Н	936			20.93	14.12 L		51-90%
GRNRA	Hedrick's Creek	41	+	1981	=<25%	12	Н	945		-,	3.03	1.52 L		N/ A
GRNRA	Hedrick's Creek	41	-		=<25%	12	Н	944		75.00	0.00	1.52.L		N/A
GRNRA	Hedrick's Creek	41			=<25%	8	Н	943		57.89	0.00	1.30 L		N/A
GRNRA	Hedrick's Creek	41			=<25%	8	Н	942		63.64	2.60	1.30 L		N/A
GRNRA	Hedrick's Creek	41			=<25%	8	Н	941	1.61	61.29	1.61	0.81 L		51-90%
GRNRA	Hedrick's Creek	41		A CONTRACTOR OF THE PARTY OF TH	=<25%	8	Н	940			0.00	0.81/L		
GRNRA	Hedrick's Creek	41			=<25%	32	Н	938			1.89	0.94 L		N/ A
		41			=<25%	32	Н	939			0.00	0.94 L		51-90%
GRNRA	Hedrick's Creek				=<25% I=25-50%	16	Н	939			37.93	28.81 M		N/ A
GRNRA	Hedrick's Creek	42		1 - 1		-		949			0.00			<50%
GRNRA	Hedrick's Creek	42				8	H	956			0.00	0.00 N 0.00 N		N/A
GRNRA	Hedrick's Creek Hedrick's Creek	42			one =<25%		Н	-			4.69			N/ A
		4				8	H	955 954				5.73 L		51-90%
GRNRA	Hedrick's Creek	42			=<25%	8	_				6.78 4.88	5.73 L		51-90%
GRNRA	Hedrick's Creek				I=25-50%	8	H	953				24.83 L		51-90%
GRNRA	Hedrick's Creek	42			1=25-50%	1 -		952			44.78	24.83 L		51-90%
GRNRA	Hedrick's Creek	42	13	165 L	=<25%	8	Н	950	0.00	41.30	2.17	5.14 L		N/A

Sile	Location Name	PlotiD	Plot# T	reetD Density Est	DBH	Viant	BranchiD	Percent Tip Dead	Percent Tip New	Branch HWA	Tree HWA Avg Percent	Tree HWA Avg Density	HWA Mortality Est
Site GRNRA	Hedrick's Creek	42	13	164 M=25-50%	16	Н	948	4,55	51.52	19.70	28.81 M	Hig Donally	<50%
GRNRA	Hedrick's Creek	42	13	163 L=<25%	6	Н	947	10.91	29.09	12.73	12.73 L		51-90%
GRNRA	Hedrick's Creek	42	13	162 L=<25%	10	Н	946	7.84	41.18	1.96	1.96 L		N/A
GRNRA	Hedrick's Creek	42	13	165 L=<25%	8	Н	951	21.62	32.43	8.11	5.14 L		51-90%
GRNRA	Hedrick's Creek	43	14	172 None	10	Н	964	0.00	77.03	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	43	14	171 L=<25%	12	LD	961	0.00	62.50	37.50	25.98 M		51-90%
GRNRA	Hedrick's Creek	43	14	170 None	8	Н	960	7.41	0.00	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	43	14	170 None	8	Н	959	4.35	34.78	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	43	14	169 None	10	Н	958	0.00	54.02	0.00	0.00 N		N/A
GRNRA	Hedrick's Creek	43	14	171 L=<25%	12	LD	962	0.00	71.08	14.46	25.98 M		51-90%
GRNRA	Hedrick's Creek	43	14	172 None	10	Н	963	0.00	68.29	0.00	0.00 N		N/A
NRGNR	Fern Creek	44	15	175 None	6	LD	970	10.81	13.51	0.00	0.00 N		N/A
NRGNR	Fem Creek	44	15	178 L=<25%	10	LD	973	0.00	21.43	0.00	0.81 L		N/A
NRGNR	Fern Creek	44	15	178 L=<25%	10	LD	974	0.00	59.68	1.61	0.81 L		51-90%
NRGNR	Fern Creek	44	15	176 None	26	MD	971	7.89	47.37	0.00	0.00 N		N/A
NRGNR	Fern Creek	44	15	175 None	6	LD	969	0.00	72.34	0.00	0.00N		N/A
NRGNR	Fern Creek	44	15	174 None	10	MD	968	9.80	62.75	0.00	0.00 N		N/A
NRGNR	Fern Creek	44	15	174 None	10	MD	967	0.00	71.01	0.00	0.00 N		N/A
NRGNR	Fern Creek	44	15	173 None	:8	Н	966	0.00	62.50	0.00	0.00 N		N/A
NRGNR	Fern Creek	44	15	173 None	8	Н	965	0.00	33.90	0.00	0.00 N		N/A
NRGNR	Fern Creek	44	15	177 None	12	Н	972	0.00	41.86	0.00	0.00 N		N/A
NRGNR	Fem Creek	45	16	181 L=<25%	12	Н	979	2.27	29.55	0.00	0.96 L		N/A
NRGNR	Fern Creek	45	16	180 L=<25%	10	Н	977	0.00	0.00	0.00	5.71 L		N/A
NRGNR	Fern Creek	45	16	180 L=<25%	10	Н	978	1.43	2.86	11.43	5.71 L		51-90%
NRGNR	Fem Creek	45	16	179 L=<25%	10	Н	975	0.00	52.63	3.51	5.03 L	*	N/A
NRGNR	Fem Creek	45	16	179 L=<25%	10	Н	976	4.92	85.25	6.56	5.03 L		51-90%
NRGNR	Fern Creek	45	16	181 L=<25%	12	Н	980	30.77	7.69	1.92	0.96 L		51-90%
NRGNR	Fem Creek	45	16	183 None	6	Н	984	0.00	100.00	0.00	0.00 N		N/A
NRGNR	Fem Creek	45	16	183 None	6	Н	986	0.00	97.14	0.00	0.00°N		N/A
NRGNR	Fern Creek	45	16	183 None	6	Н	985	2.78	94.44	0.00	0.00 N		N/A
NRGNR	Fern Creek	45	16	182 None	12	Н	981	0.00	51.79	0.00	0.00 N		N/A
NRGNR	Fern Creek	45	16	182 None	12	Н	982	0.00	73.08	0.00	0.00 N		N/A
NRGNR	Fem Creek	45	16	183 None	6	Н	983	0.00	88.14	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17	186 None	16	Н	997	1.54	73.85	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17	186 None	16	Н	998	0.00	78.05	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17	186 None	16	Н	995	0.00	72.55	0.00	0.00 N		N/A
NRGNR	Fem Creek	46	17	186 None	16	Н	994	0.00	46.34	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17	185 L=<25%	14	Н	990	0.00	88.89	1.85	0.46 L		51-90%
NRGNR	Fem Creek	48	17	185 L=<25%	14	Н	991	0.00	97.22	0.00	0.46 L		N/A
NRGNR	Fern Creek	46	17	185 L=<25%	14	Н	992	0.00	88.46	0.00	0.46 L		N/A
NRGNR	Fern Creek	46	17	187: None	22	Н	1000	10.67	26.67	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17	184 None	10	Н	987	9.52	90.48	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17	184 None	10	Н	989	0.00	98.11	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17	184 None	10	Н	988	0.00	100.00	0.00	0.00 N		N/A
NRGNR	Fern Creek	46	17.	185 L=<25%	14	Н	993	0.00	0.00	0.00	0.46 L		N/A
NRGNR	Fern Creek	46	17	187 None	22	Н	999	0.00	54.55	0.00	0.00 N		N/A
NIRGNR	Fern Creek	46	17	188 L=<25%	30	Н	1003	15.91	22.73	2.27	9.83 L		51-90%
NRGNR	Fern Creek	46	17	187 None	22	Н	998	0.95	40.00	0.00	0.00 N		N/A
NRGNR	Fem Creek	46	17	187 None	22	Н	1001	0.00	68.13	0.00	0.00iN		N/A
NRGNR	Fern Creek	46	17	188 L=<25%	30	Н	1004	3.70	22.22	22.22	9.83 ['] L		<50%
NRGNR	Fern Creek	46	17	188 L=<25%	30	Н	1002	0.00	33.33	14.81	9.83 L		<50%
NRGNR	Fem Creek	46	17	188 L=<25%	30	Н	1005	2.99	65.67	0.00	9.83 L		N/A
NRGNR	Fern Creek	47	18	192 L=<25%	16	Н	1017	0.00	35.56	0.00	1.09 L		N/A

			Dist	Prev HWA	THE PERSON NAMED IN	Messal	Propel ID	Percent To Dead	Percent Tip New	Branch HWA	Avg Percent	Avg Density	HWA Adopting Est
Site	Location Name	PlotID.	Plot # 1	192 L=<25%	16	H	1016	Tip Dead 0.00	29.51	3.28	1.09 L	2. Avgi beisity in	Mortality Est. 51-90%
NRGNR	Fem Creek	47	18	190 None	12	н	1009	0.00	72.00	0.00	0.00 N		N/A
NRGNR	Fem Creek	47	18	191 L=<25%	8	н	1012	0.00	65.52	0.00	1.80 L		N/A
NRGNR	Fern Creek	47	18	192 L=<25%	16	H	1012	0.00	47.69	0.00	1.09 L		N/A
NRGNR	Fem Creek	47	18	191 L=<25%	8	Н	1013	0.00	59.30	0.00	1.80 L		N/A
NRGNR	Fern Creek	47	18	190 None		Н	1010	2.17	51.09	0.00	0.00 N		N/A
NRGNR	Fem Creek	47	18	190 None	12	Н	1011	6.38	70.21	0.00	0.00 N		N/A
NRGNR NRGNR	Fern Creek	47	18	89 None	22	Н	1008	0.00	62.26	0.00	0.00 N		N/A
	Fern Creek	47	18	189 None	22	H	1006	12.28	75.44	0.00	0.00 N		N/A
NRGNR		47	18	191 L=<25%	8	Н	1014	0.00	32.43	5.41	1.80 L		51-90%
NRGNR	Fem Creek	47	18	189 None	22	Н	1007	0.00	62.32	0.00	0.00 N		N/A
NRGNR NRGNR	Fern Creek	48	19	194 None	22	H	1025	0.00	58.04	0.00	0.00 N		N/A
- Constitution of the	Fern Creek	48	19	194 None	22	н	1023	2.35	62.35	0.00	0.00 N		N/A
NRGNR	Fern Creek	48	19	194 None	22	Н	1023	2.47	77.78	0.00	0.00 N		N/A
NRGNR	Fem Creek	48	19	194 None	22	Н	1023	4.00	42.67	0.00	0.00 N		N/A
NRGNR	Fern Creek	48	19	193 L=<25%	14	Н	1020	3.13	25.00	0.00	0.39 L		N/A
NRGNR	Fern Creek	48	19	193 L=<25%	14	Н	1018	0.00	83.87	0.00	0.39 L		
NRGNR	Fern Creek	48	19	193 L=<25%	14	Н	1018	0.00	57.81	1.56	0.39 L		N/A 51-90%
NRGNR NRGNR	Fem Creek		19	193 L=<25%	114			0.00	44.44	0.00	the state of the s		200.00
CARREST CO.	Fem Creek	48	23		16	H	1019	0.00	30.36	0.00	0.39 L		N/A
NRGNR	Fern Creek	49	23	198 None 198 None	16	Н	1033	0.00	57.81	0.00	0.00 N		N/A N/A
NRGNR	Fern Creek	49	23	197 None	32	Н	1034	0.00	80.85	0.00	0.00 N		
NRGNR		49	23	197 None	32	Н	1033	0.00	82.22	0.00	0.00 N		N/A
NRGNR	Fern Creek	49	23	197 None	32	Н	1032	0.00	76.19	0.00	0.00 N		N/A N/A
NRGNR	Fern Creek	49	23	196 None	10	H	1029	0.00	76.19	0.00			
A CONTRACTOR OF THE PARTY OF	Alatan and a second a second and a second an	49	23	195 L=<25%	8	Н	1029	0.00	84.85	6.06	0,00 N 16.63 L		N/A
NRGNR	Fern Creek	49	23	199 None	8	LD	1038	3.57	78.57	0.00			51-90%
NRGNR			23	195 L=<25%	8	Н	1036	0.00	69.39	12.24	0.00 N		N/A
	Fem Creek	49	23	198 None	16	Н	1026.	0.00			16.63 L		51-90%
NRGNR NRGNR	Fern Creek	49	23	199 None	8	LD	1036	5.66	43.10 58.49	0.00	0.00 N		N/A
	Fern Creek		23		12	LD			57.14	0.00	0.00 N		N/A
NRGNR	Fern Creek	49		200 None 200 None	12	LD	1040	0.00	47.44		N 00.0		N/A
NRGNR	Fern Creek	49	23	195 L=<25%	8	Н	1039		71.05	0.00 31.58	0.00 N		N/A
NRGNR	Fern Creek	49	23					0.00	71.03		16.63 L		51-90%
NRGNR	Fern Creek	49		196 None	10	Н	1030	0.00	The second second second second	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	207 None	10	H	1058	0.00	68.89	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	206 None	18	H	1055	4.00	66.00	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	-	207 None	10	H	1057	0.00	59.26	0.00	0.00(N		N/A
NRGNR	Fern Creek	50	24	207 None	10	Н	1056	0.00	76.60	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	206 None	8	H	1054	0.00	5.41	0.00	0.00 N		N/A
NRGNR		50	24	206 None	6	H	1053	0.00	56.00	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	202 None	6	H	1045	0.00	93.10	0.00	0.00 N		N/A
NRGNR NRGNR	Fern Creek	50	24	204 None 204 None	6	H	1050		86.67	0.00	0.00 N		N/A
	Fern Creek	50	24		-		1049	0.00	58.49	0.00	0.00 N		N/A
NRGNR				203 Nопе	10	H	1048	5.56	61.11	0.00	0.00 N		N/A
NRGNR	Fem Creek	50	24	203 None	10	H	1047	3.03	42.42	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	205 None	10	Н	1052	0.00	35,94	0.00	0.00N		N/A
NRGNR	Fern Creek	50	24	205 None	10	H	1051	0.00	46.15	0.00	0.00 N	1111 - 111	N/A
NRGNR	Fern Creek	50	24	202 None	6	H	1044	0.00	75.76	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	202 None	6	H	1043	0.00	59.38	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	201 None	10	H	1042	2.94	8.82	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	201 None	10	H	1041	0.00	59.15	0.00	0.00 N		N/A
NRGNR	Fern Creek	50	24	203 None	10	H	1046	6.06	30.30	0.00	0.00 N		N/A
NRGNR	Fern Creek	51	25	211 None	10	H	1068	0.00	63.93	0.00	0.00 N		N/A

SHIP.				Prev HWA	200			Percent :	Percent	Branch HWA	Tree HWA	Tree HWA HWA
Site	Location Name	PlottD	C	TreeID Density Est			BranchID 1060	Tip Dead 0.00	33.33	0.00	Avg Percent 0.00 N	Avg Density Mortality Es
NRGNR	Fern Creek	51	the same of the sa	208 None 208 None	6	H	7					
NRGNR	Fern Creek	51		209 L=<25%	10		1059 1062	5.13 0.00	56.41 46.55	0.00 10.34	0.00 N 5.17 L	N/A
NRGNR	Fern Creek	51	-			LD	1061	1.79	58.93	0.00	5.17 L	N/A N/A
NRGNR	Fern Creek	51	er and the same of	209 L=<25%	10	4			70.59	0.00	0.00 N	N/A
NRGNR	Fem Creek	51		210 None	12	H	1065	0.00		0.00	0.00 N	
NRGNR	Fern Creek	51	-	210 None	12	H	1064	0.00	83.87			N/A
NRGNR	Fern Creek	51		211 None	10	H	1067	10.53	31.58	0.00	0.00 N	N/A
NRGNR	Fern Creek	51		211 None	10	H	1066	1.52	48.48	0.00	0.00 N	N/A
NRGNR	Fern Creek	51		212 None	12	H	1071	0.00	78.26	0.00	0.00 N	N/A
NRGNR	Fem Creek	51		212 None	112	Н	1070	0.00	70.00	0.00	0.00 N	N/A
NRGNR	Fern Creek	51		212 None	12	Н	1069	3.33	73.33	0.00	0.00 N	N/A
NRGNR	Fern Creek	51		210 None	12	Н	1063	5.00	27.50	0.00	0.00 N	N/A
NRGNR	Fern Creek	52	The second second	213 L=<25%	8	Н	1072	0.00	52.78	0.00	2.54 L	N/A
NRGNR	Fern Creek	52	-	213 L=<25%	8	Н	1075	0.00	83.33	0.00	2.54 L	N/A
NRGNR	Fern Creek	52		214 None	14	Н	1078	7.84	50.98	0.00	0.00 N	N/A
NR GNR	Fern Creek	52		213 L=<25%	8	Н	1074	0.00	66.67	10.14	2.54 L	51-90%
NRGNR	Fern Creek	52	26	216 None	10	Н	1083	0.00	66.67	0.00	0.00 N	N/A
NRGNR	Fern Creek	52	26	214 None	14	H	1077	0.00	55.32	0.00	0.00 N	N/A
NRGNR	Fem Creek	52	26	214 None	14	Н	1076	0.00	52.63	0.00	0.00 N	N/A
NRGNR	Fern Creek	52	26	215 None	14	Н	1080	0.00	82.00	0.00	0.00 N	N/A
NRGNR	Fem Creek	52	26	215 None	14	Н	1079	0.00	96.08	0.00	0.00 N	N/A
NRGNR	Fern Creek	52	26	215 None	14	Н	1081	0.00	76.92	0.00	0.00 N	N/A
NRGNR	Fem Creek	52	26	216 None	10	Н	1082	20.41	2.04	0.00	0.00 N	N/A
NRGNR	Fern Creek	52	26	213:L=<25%	8	Н	1073	6.12	0.00!	0.00	2.54 L	N/A
NRGNR	Fem Creek	52	26	217 None	10	Н	1085	7.58	50.00	0.00	0.00 N	N/A
NRGNR	Fern Creek	52	26	217 None	10	Н	1086	2.22	21.11	0.00	0.00 N	:N/A
NRGNR	Fern Creek	52	26	216 None	10	Н	1084	13.73	62.75	0.00	0.00 N	N/A
NRGNR	Fern Creek	53	27	221:None	16	Н	1096	1.39	22.22	0.00	0.00 N	N/A
NRGNR	Fem Creek	53	-	221 None	16	Н	1093	6.00	24.00	0.00	0.00 N	N/A
NRGNR	Fern Creek	53		222 None	10	Н	1097	0.00	83.08	0.00	0.00 N	N/A
NRGNR	Fern Creek	53	and the second second	222 None	10	Н	1098	0.00	30.65	0.00	0.00 N	N/A
NRGNR	Fem Creek	53	3. 27	222 None	10	Н	1099	0.00	55.36	0.00	0.00 N	N/A
NRGNR	Fem Creek	53		221 None	16	Н	1094	0.00	17.39	0.00	0.00 N	N/A
NRGNR	Fern Creek	53	-	220 None	10	Н	1091	0.00	73.75	0.00	0.00 N	N/A
NRGNR	Fem Creek	53		221 None	16	Н	1095	0.00	0.00	0.00	0.00 N	N/A
NRGNR	Fern Creek	53		218 L=<25%	12	Н	1088	4.26	53.19	2.13	1.06 L	51-90%
NRGNR	Fern Creek	53	1	218 L=<25%	12	Н	1087	0.00	59.46	0.00	1.06 L	N/A
NRGNR	Fern Creek	53		219 None	10	Н	1090	0.00	86.67	0.00	0.00 N	N/A
NRGNR	Fern Creek	53		219 None	10	Н	1089	0.00	56.76	0.00	0.00 N	N/A
NRGNR	Fern Creek	53		220 None	10	H	1092	5.97	59.70	0.00	0.00 N	N/A
NRGNR	Fern Creek	54	and the same	223 None	14	Н	1101	0.00	93.75	0.00	0.00 N	IN/A
NRGNR	Fern Creek	54	-	223 None	14	Н	1102	0.00	66.67	0.00	0.00 N	N/A
NRGNR	Fern Creek	54		224 None	12	H	1103	0.00	70.49	0.00	0.00 N	
NRGNR	Fem Creek	54		224 None	12	H	1105	0.00	91,43	0.00	0.00 N	N/A
NRGNR	Fem Creek	54		226 None	18	H	1103	3.13	32.81	0.00		N/A
		54			18	H	1108	0.00	60.00	the state of the s	0.00 N	N/A
NRGNR	Fern Creek	54	1	226 None 226 None		Н	1108	5.71	42.86	0.00	0.00 N	N/A N/A
NRGNR	Fern Creek				18			0.00	100	0.00		N/A N/A
NRGNR	Fem Creek	54		226 None	18	H	1110	0.00	69.23	0.00	0.00 N 0.00 N	N/A
NRGNR	Fern Creek			223 None	_				37.84			
NRGNR	Fern Creek	54		224 None	12	H	1104	2.56	94.87	0.00	0.00 N	N/A
NRGNR	Fem Creek	54	4 1124	225 None	14	H	1106	0.00	92.98	0.00	0.00 N	N/A
NRGNR	Glade Creek	55	4	229 L=<25%	10	H	1115	4.05	54.05	0.00	0.00 N	N/A
NRGNR	Glade Creek	55	5 4	227 H>50%	16	LD	1111	0.00	34.48	65.52	43.66 M	51-90%

NRGNR G NRGNR	Glade Creek	55 55 55 55 55 55 55 55 55 55 55 55 55	Plot # 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 5	TreeID Density E 227 H>50% 228 H>50% 229 L=<25% 230 L=<25% 231 L=<25% 231 L=<25% 231 L=<25% 231 L=<25% 232 L=<25% 232 L=<25% 232 L=<25% 232 H>50% 236 H>50% 236 H>50% 237 L=<25% 237 L=<2	16 8 10 6 6 14 14 10 10 12 8 12 10	HHHHHMD MD HMD LD	1112 1113 1116 1117 1118 1119 1120 1121 1122 1124 1114 1123	Tip Dead 0.00 0.00 3.23 3.90 6.67 0.00 0.00 6.06 4.55 16.67 0.00 0.00 0.00 0.00 0.00 0.00 0.00	11.54 100.00 20.78 5.00 49.18 33.85 40.91 9.09 5.56 2.70	21.79 3.23 0.00 0.00 0.00 1.52 0.00 5.56	Avg Percent 43,66 M 9.31 L 0.00 N 0.00 N 0.76 L 2.78 L 2.78 L 100.00 H	Avg Density	Mortality Est 51-90% >90% N/A N/A N/A N/A 51-90% N/A 51-90% 51-90% >90%
NRGNR G NRGNR	Glade Creek	55 55 55 55 55 55 55 55 55 55 55 55 56 56	4 4 4 4 4 4 4 5 5 5 5	228 H>50% 229 L=<25% 230 L=<25% 230 L=<25% 231 L=<25% 231 L=<25% 232 L=<25% 232 L=<25% 233 H>50% 228 H>50% 236 H>50% 237 L=<25% 237 L=<25%	8 10 6 6 14 14 10 10 12 8 12 10 10	H H H H H MD MD MD H MD LD	1113 1116 1117 1118 1119 1120 1121 1122 1124 1114 1123	3.23 3.90 6.67 0.00 0.00 6.06 4.55 16.67	100.00 20.78 5.00 49.18 33.85 40.91 9.09 5.56 2.70	3.23 0.00 0.00 0.00 0.00 1.52 0.00 5.56	9.31 L 0.00 N 0.00 N 0.00 N 0.76 L 0.76 L 2.78 L 100.00 H		>90% N/A N/A N/A N/A N/A S1-90% N/A 51-90% 51-90%
NRGNR G	Glade Creek	55 55 55 55 55 55 55 55 55 55 56 56 56 5	4 4 4 4 4 4 5 5 5 5	229' L=<25% 230 L=<25% 230 L=<25% 231 L=<25% 231 L=<25% 232 L=<25% 232 L=<25% 233 H>50% 238 H>50% 236 H>50% 237 L=<25% 237 L=<25%	10 6 6 14 14 10 10 12 8 12 10	H H H H MD MD MD H MD	1116 1117 1118 1119 1120 1121 1122 1124 1114 1123	3.90 6.67 0.00 0.00 6.06 4.55 16.67	20.78 5.00 49.18 33.85 40.91 9.09 5.56 2.70	0.00 0.00 0.00 0.00 1.52 0.00 5.56	0.00 N 0.00 N 0.00 N 0.76 L 0.76 L 2.78 L 2.78 L		N/A N/A N/A N/A 51-90% N/A 51-90%
NRGNR G	Glade Creek	55 55 55 55 55 55 55 55 55 56 56 56 56 5	4 4 4 4 4 4 5 5 5 5	230 L=<25% 230 L=<25% 231 L=<25% 231 L=<25% 232 L=<25% 232 L=<25% 233 H>50% 248 H>50% 236 H>50% 237 L=<25% 237 L=<25%	6 6 14 14 10 10 12 8 12 10	H H H MD MD MD MD H MD	1117 1118 1119 1120 1121 1122 1124 1114 1123	6.67 0.00 0.00 6.06 4.55 16.67	5.00 49.18 33.85 40.91 9.09 5.56 2.70	0.00 0.00 0.00 1.52 0.00 5.56	0.00 N 0.00 N 0.76 L 0.76 L 2.78 L 2.78 L 100.00 H		N/A N/A N/A 51-90% N/A 51-90% 51-90%
NRGNR G	Glade Creek	55 55 55 55 55 55 55 55 56 56 56 56 56	4 4 4 4 4 4 5 5 5 5	230 L=<25% 231 L=<25% 231 L=<25% 232 L=<25% 232 L=<25% 233 H>50% 228 H>50% 236 H>50% 237 L=<25% 237 L=<25%	6 14 14 10 10 12 8 12 10	H H MD MD MD H MD	1118 1119 1120 1121 1122 1124 1114 1123	0.00 0.00 6.06 4.55 16.67 0.00	49.18 33.85 40.91 9.09 5.56 2.70	0.00 0.00 1.52 0.00 5.56 100.00	0.00 N 0.76 L 0.76 L 2.78 L 2.78 L 100.00 H		N/A N/A 51-90% N/A 51-90%
NRGNR G	Glade Creek	55 55 55 55 55 55 55 56 56 56 56 56	4 4 4 4 4 5 5 5 5	231 L = <25% 231 L = <25% 232 L = <25% 232 L = <25% 233 H>50% 228 H>50% 233 H>50% 231 H>50% 232 H= <25% 237 L = <25%	14 14 10 10 12 8 12 10	H MD MD MD MD H MD	1119 1120 1121 1122 1124 1114 1123	0.00 6.06 4.55 16.67 0.00	33.85 40.91 9.09 5.56 2.70	0.00 1.52 0.00 5.56 100.00	0.76 L 0.76 L 2.78 L 2.78 L 100.00 H		N/A 51-90% N/A 51-90% 51-90%
NRGNR G	Glade Creek	55 55 55 55 55 55 55 56 56 56 56 56 56	4 4 4 4 5 5 5 5	231 L= <25% 232 L= <25% 232 L= <25% 233 H>50% 228 H>50% 233 H>50% 236 H>50% 237 L= <25% 237 L= <25%	14 10 10 12 8 12 10	H MD MD MD H MD	1120 1121 1122 1124 1114 1123	6.06 4.55 16.67 0.00	40.91 9.09 5.56 2.70	1.52 0.00: 5.56 100.00	0.76 L 2.78 L 2.78 L 100.00 H		51-90% N/A 51-90% 51-90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek	55 55 55 55 55 56 56 56 56 56 56	4 4 4 4 5 5 5 5 5	232 L = <25% 232 L = <25% 233 H>50% 228 H>50% 233 H>50% 236 H>50% 237 L = <25% 237 L = <25%	10 10 12 8 12 10	MD MD MD H MD	1121 1122 1124 1114 1123	4.55 16.67 0.00	9.09 5.56 2.70	0.00 5.56 100.00	2.78 L 2.78 L 100.00 H		N/A 51-90% 51-90%
NRGNR G	Glade Creek	55 55 55 55 56 56 56 56 56 56 56	4 4 4 5 5 5 5 5	232 L=<25% 233 H>50% 228 H>50% 233 H>50% 236 H>50% 237 L=<25% 237 L=<25%	10 12 8 12 10	MD MD H MD	1122 1124 1114 1123	16.67 0.00	5. 56 2.70	5.56 100.00	2.78 L 100.00 H		51-90% 51-90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek	55 55 55 56 56 56 56 56 56 56	4 4 4 5 5 5 5 5	233 H>50% 228 H>50% 233 H>50% 236 H>50% 237 L= <25% 237 L=<25%	12 8 12 10 10	MD H MD LD	1124 1114 1123	0.00	2.70	100.00	100.00 H		51-90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek	55 55 56 56 56 56 56 56 56	4 4 5 5 5 5 5	228 H>50% 233 H>50% 236 H>50% 237 L= <25% 237 L=<25%	8 12 10 10	H MD LD	1114						
NRGNR CONTROL OF THE PROPERTY	Glade Creek	55 56 56 56 56 56 56 56	4 5 5 5 5 5 5	233 H>50% 236 H>50% 237 L= <25% 237 L=<25%	12 10 10	MD LD	1123	0.00		45.00	0.241		>90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek	56 56 56 56 56 56 56	5 5 5 5 5	236 H>50% 237 L= <25% 237 L=<25%	10 10	LD		4 70	100.00	15.38	9.31 L		
NRGNR CONTROL OF THE PROPERTY	Glade Creek	56 56 56 56 56 56	5 5 5	237 L= <25% 237 L=<25%	10	-		1.79	0.00	100.00	100.00 H		51-90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek	56 56 56 56 56	5 5 5	237 L=<25%			1131	6.67	26.67	40.00	14.19 L		N/A
NRGNR CONTROL OF THE PROPERTY	Glade Creek Glade Creek Glade Creek Glade Creek Glade Creek Glade Creek Glade Creek	56 56 56 56	5 5			Н	1135	8.89	86.67	2.22	3.79 L		N/A
NRGNR CONTROL OF THE PROPERTY	Glade Creek Glade Creek Glade Creek Glade Creek Glade Creek Glade Creek	56 56 56	5	237 L= <25%	10	Н	1133	30.61	59.18	8.16	3.79 L		N/A
NRGNR CONTROL OF THE PROPERTY	Glade Creek Glade Creek Glade Creek Glade Creek	56 56			10	Н	1134	1.96	54.90	0.98	3.79 L		51-90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek Glade Creek Glade Creek	56	5	236 H>50%	10	LD	1132	0.00	15.38	2.56	14.19 L		>90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek Glade Creek			236 H>50%	10	LD	1130	0.00	10.87	0.00	14.19 L		>90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek	56	5	235 H>50%	8	SD	1129	0.00	72.34	10.64	7.95 L		51-90%
NRGNR C NRGNR C NRGNR C NRGNR C NRGNR C NRGNR C NRGNR C NRGNR C NRGNR C NRGNR C			5	235 H>50%	8	SD	1128	0.00	64.91	5.26	7.95 L		51-90%
NRGNR G NRGNR G NRGNR G NRGNR G NRGNR G NRGNR G NRGNR G NRGNR G NRGNR G	Glade Creek	56	5	234 L= <25%	10	LD	1125	0.00	37.31	1.49	2.88 L		51-90%
NRGNR CONTROL OF THE PROPERTY	OIGGG OIGGK	56	5	234 L= <25%	10	LD	1127	0.00	0.00	7.14	2.88 L		51-90%
NRGNR CONTROL OF CONTR	Glade Creek	56	5	234 L= <25%	10	LD	1126	0.00	81.94	0.00	2.88 L		N/A
NRGNR CONTROL OF CONTR	Glade Creek	57	6	239 None	10	MD	1138	0.00	51.28	0.00	0.00 N		N/A
NRGNR C NRGNR C NRGNR C NRGNR C NRGNR C	Glade Creek	57	6	241 L= <25%	6	H	1143	0.00	85.71	21.43	11.76 L		51-90%
NRGNR CONTROL OF THE PROPERTY	Glade Creek	57	6	239 None	10	MD	1139	0.00	80.38	0.00	0.00 N		N/A
NRGNR C NRGNR C NRGNR C	Glade Creek	57	6	241 L= <25%	6	H	1144	0.00	56.25	2.08	11.76 L		N/A
NRGNR C NRGNR C NRGNR C	Glade Creek	57	6	242 L= <25%	6	Н	1146	0.00	31.82	0.00	0.74 L		N/A
NRGNR C	Glade Creek	57	6	242 L= <25%	6	Н	1145	0.00	29.41	1.47	0.74 L		N/A
100	Glade Creek	57	6	243 L= <25%	10	Н	1147	2.99	41.79	0.00	2.13 L		N/A
	Glade Creek	57	6	243 L= <25%	10	Н	1148	0.00	48.94	4.26	2.13 L		>90%
NRGNR (Glade Creek	57	6	240;L= <25%	8	Н	1141	0.00	65.12	0.00	1.08 L		N/A
	Giade Creek	57	6	240 L= <25%	8	Н	1140	4.76	92.86	0.00	1.08.L		N/A
NRGNR C	Glade Creek	57	6	238 None	6	MD	1137	19.23	38.46	0.00	0.00 N		N/A
NRGNR C	Glade Creek	57	6	238 None	6	MD	1136	48.48	0.00	0.00	0.00 N		N/A
NRGNR C	Glade Creek	57	6	240 L= <25%	8	Н	1142	0.00	77.42	3.23	1.08 L		N/A
NRGNR (Glade Creek	58	7	244 L= <25%	8	LD	1149	0.00	87.27	0.00	1.72 L		N/A
NRGNR C	Glade Creek	58	7	244 L= <25%	8	LD	1150	0.00	63.79	3.45	1.72 L		>90%
NRGNR C	Glade Creek	58	7!	245 L= <25%	6	Н	1151	0.00	9.09	9.09	8.30 L		>90%
NRGNR C	Glade Creek	58	7	245 L=-<25%	6	Н	1152	0.00	37.50	7.50	8.30 L		>90%
	Glade Creek	59	8	246 L= <25%	10	LD	1153	0.00	46.55	3.45	7.97 L		N/A
	Glade Creek	59	812		10	LD	1154	0.00	51.56	12.50	7.97 L		51-90%
	Glade Creek	59	8	247 L=<25%	14	MD	1155	15.91	20.45	2.27	2.27 L		51-90%
The second second	Glade Creek	59	8	248 L= <25%	12	LD	1156	0.00	37.29	3,39	3.39 L		51-90%
the state of the s	Glade Creek	59	8	249 L= <25%	10	Н	1158	0.00	48.57	0.00i	1.61 L		N/A
	Glade Creek	59	8	249 L= <25%	10	Н	1157	0.00	45.16	3.23	1.61 L		>90%
	Glade Creek	60	9	250 L= <25%	26	MD	1159	0.00	34.29	11.43	18.21 L	******	N/A
	Glade Creek	60	9	250 L= <25%	26	MD	1160	0.00	32.14	25.00	18.21 L		<50%
		60	9	251 L= <25%	6	LD	1161	0.00	77.78	18.52	10.01 L		51-90%
		60	9	251 L= <25%	6	LD	1162	0.00	37.31	1.49	10.01 L		51-90%
	Glade Creek	21	20	15 H>50%	10	Н	499	0.00	32.43	21.62	42.50 M		
	Glade Creek Glade Creek		20	16 L= <25%	12	Н	503	0.00	100.00	0.00	8.50 L		<50% N/A
NRGNR (Glade Creek	21	20	13 L=<25%	8	LD	503	0.00	100.00	0.00	0.30 L		IN/A

Site	Location Name	PlotID	Plot# T	Prev HWA	DRI	LI VIII	Branchip	Percent Tip Dean	Percent Tip Nev	Branch HWA Percent	Tree HWA Avg Percent	Tree HWA	HWA.
NRGNR	Grandview	21	20	15 H>50%	10	H	497	2.70	2.70	100.00	42.50 M	Avy Density	Mortality Est
NRGNR	Grandview	21	20	15 H>50%	10	Н	498	2.44	0.00	24.39	42.50 M		<50%
NRGNR	Grandview	21	20	15 H>50%	10	Н	496	0.00	18.00	24.00	42.50 M		<50%
NRGNR	Grandview	21	20	14 L=<25%	14	Н	494	1.92	82.69	0.00	0.00 N		N/A
NRGNR	Grandview	21	20	14:L=<25%	14	iH.	493	3.85	92.31	00.0	0.00 N	77	N/A
NRGNR	Grandview	21	20	14 L=<25%	14	Н	492	0.00	96.47	0.00	0.00 N		N/A
NRGNR	Grandview	21	20	14 L=<25%	14	Н	495	5.88	82.35	0.00	0.00 N		N/A
NRGNR	Grandview	21	20	13:L=<25%	8	LD	491	0.00	15.07	2.74	0.68 L		N/A
NRGNR	Grandview	21	20	13!L=<25%	8	LD	490	4.71	10.59	0.00	0.68 L		N/A
NRGNR	Grandview	21	20	16 L=<25%	112	Н	501	0.00	54.65	0.00	8.50 L		N/A
NRGNR	Grandview	21	20	16 L=<25%	12	Н	500	0.00	96.10	0.00	8,50'L		N/A
NRGNR	Grandview	21	20	13 L=<25%	8	LD	488	0.00	23.17	0.00	0.68 L		N/A
NRGNR	Grandview	21	20	18 L=<25%	12	Н	502	2.00	2.00	34.00	8.50 L		<50%
NRGNR	Grandview	21	20	11 L=<25%	10	Н	481	1.92	98.08	0.00	0.00 N		N/A
NRGNR	Grandview	21	20	12 M=25-50%	14	LD	486	0.00	0.00	36.11	48.92 M		<50%
NRGNR	Grandview	21	20	12 M=25-50%	14	LD	487	0.00	20.93	55.81	48.92 M		<50%
NRGNR	Grandview	21	20	12 M=25-50%	14	LD	485	0.00	7.50	97.50	48.92 M		<50%
NRGNR	Grandview	21	20	11 L=<25%	10	Н	482	0.00	77.38	0.00	0.00 N		N/A
NRGNR	Grandview	21	20	11.L=<25%	10	Н	480	2.78	35.19	0.00	0.00 N		N/A
NRGNR	Grandview	21	20	11 L=<25%	10	Н	479	1.52	74.24	0.00	0.00 N		N/A
NRGNR	Grandview	21	20	10 L=<25%	10	Н	476	0.00	82.14	0.00	20.00 L		N/A
NRGNR	Grandview	21	20	10 L=<25%	10	Н	483	0.00	62.04	0.00	20.00 L		N/A
NRGNR	Grandview	21	20	10 L=<25%	10	Н	477	5.15	77.32	0.00	20.00 L		N/A
NRGNR	Grandview	21	20	10 L=<25%	10	H	475	0.00	64.00	0.00	20.00 L		N/A
NRGNR	Grandview	21	20	10 L=<25%	10	Н	478	0.00	0.00	100.00	20.00 L		<50%
NRGNR	Grandview	21	20	12 M=25-50%	14	LD	484	6.25	0.00	6.25	48.92 M		<50%
NRGNR	Grandview	22	21	19 L=<25%	10	H	511	1.61	79.03	3,23	1.79 L		51-90%
NRGNR	Grandview	22	21	18 L=<25%	12	3 H	509	2.08	52.08	0.00	0.62 L		N/A
NRGNR	Grandview	22	21	18 L=<25%	12	H	508	0.00	66.67	1.85	0.62 L		51-90%
NRGNR	Grandview	22	21	17 L=<25%	12	Н	507	3.17	82.54	0.00	0.33 L		N/A
NRGNR	Grandview	22	21	17 L=<25%	12	Н	504	2.67	89.33	1.33	0.33 L		<50%
NRGNR	Grandview	22	21	17 L=<25%	12	Н	506	0.00	95.74	0.00	0.33 L		N/A
NRGNR	Grandview	22	21	17 L=<25%	12	H	505	13.24	50.00	0.00	0.33 L		N/A
NRGNR	Grandview	22	21	22 L=<25%	10	LD	521	0.00	97.50	0.00	20. 83 L		N/A
NRGNR	Grandview	22	21	19 L=<25%	10	Н	513	5.38	66.67	2.15	1.79 L		51-90%
NRGNR	Grandview	22	21	24:L=<25%	10	H	527	2.22	73.33	2.22	22.73 L		N/A
NRGNR	Grandview	22	21	24 L=<25%	10	Н	528	13.51	62.16	43.24	22.73 L	~~****	51-90%
NRGNR	Grandview	22	21	23 L=<25%	20	LD	526	0.00	76.47	52.94	29.87 M		>90%
NRGNR	Grandview	22	21	23 L=<25%	20	LD	525	0.00	73.33	8.89	29.87 M		N/A
NRGNR	Grandview	22		23 L=<25%	20	LD	524	0.00	66.67	27.78	29.87 M		>90%
NRGNR	Grandview	22		18 L=<25%	12	H	510	0.00	31.58	0.00	0.62 L		N/A
NRGNR	Grandview	22		22 L=<25%	10	LD	522	3.23	62.90	0.00	20.83 L		N/A
NRGNR	Grandview	22		19 L=<25%	10	H	512	0.00	78.00	0.00	1.79 L		N/A
NRGNR	Grandview	22		21 L=<25%	10	H	518	0.00	69.70	30.30	11.90 L		51-90%
NRGNR	Grandview	22	21	21 L=<25%	10	Н	520	5.36	35.71	10.71	11.90 L		51-90%
NRGNR	Grandview	22		21 L=<25%	10	Н	519	0.00	83.00	4.00 2.60	11.90 L		51-90%
NRGNR	Grandview	22		21 L=<25%	10	H	517	0.00	94.81		11.90 L		N/A
NRGNR	Grandview	22	21:	20 L=<25%	12	LD	516	5.71	40.00	2.86	14.91 L		N/A
NRGNR	Grandview	22		20 L=<25%	12	LD	514	0.00	0.00	41.86	14.91 L		N/A
NRGNR	Grandview	22		20 L=<25%	12	LD	515	11.76	76.47	0.00	14.91 L		N/A
NRGNR	Grandview	22		22 L=<25%	10	LD	523	0.00	5.00	62.50	20.83 L		51-90%
NRGNR	Grandview	23		34 L=<25%	10	H	557	0.00	22.73	59.09	19.40 L		51-90%
NRGNR	Grandview	23	22	25 L=<25%	10	H	531	0.00	100.00	3.23	22.67 L		N/A

Site!	Location Name	PlotID	Plot#	Prev HWA	SECURIVE SEA	Vigo	EL THE THE PERSON NAMED IN	Tip Dead	Percent	Brarich HWA	Tree HWA	Tree HWA	HWA
NRGNR	Grandview Caracter Name	23	22	28 L=<25%	12	LD	BranchID 538	8.33	52.08	Percent 10.42	Avg Percent: 1	Avg Density!	Mortality Est
NRGNR	Grandview	23	22	28 L=<25%	12	LD	539	0.00	42.31	9.62	18.02 L		N/A
NRGNR	Grandview	23	22	29 L=<25%	16	MD	542	5.56	86.11	0.00			51-90%
NRGNR	Grandview	23	22	29 L=<25%	16	MD	541	5.00	85.00	0.00	1.59 L 1.59 L		N/A
NRGNR	Grandview	23	22	29 L=<25%	16	MD	540	2.38	64.29	4.76	1.59 L		N/A
NRGNR	Grandview	23	22	30 L=<25%	10	LD	545	0.00	77.61	1,49	1.59 L 1.31 L		N/A
NRGNR	Grandview	23	22	30 L=<25%	10	LD	544	1.33	82.67	0.00			N/A
NRGNR	Grandview	23	22	30 L=<25%	10	LD	543	7.32	48.78	2.44	1.31 L 1.31 L		N/A
NRGNR	Grandview	23	22	28 L=<25%	12	LD	536	1.54	81.54	49.23	18.02 L		>90%
	TO AND DESCRIPTION OF THE PERSON OF THE PERS	23	22	31M=25-50%	10	MD	548	8,11	70.27	5.41	37.53 M		<50%
NRGNR	Grandview	23	22	31M=25-50%	10	MD	546	0.00	51.85	77.78	37.53 M		>90%
NRGNR	Grandview								60.00				>90%
NRGNR	Grandview	23	22	31;M=25-50%	10	MD	549	6.67	The second second second second	4.44	37.53 M		N/A
NRGNR	Grandview	23	22	32 L=<25% 33 L=<25%	12	LD	550	12.50	60.00	0.00	6.00 L		N/A
NRGNR	Grandview	23	22		8	H	552	3.33	80.00	0.00	2.30 L		N/A
NRGNR	Grandview	23	22	33 L=<25%	8	H	553	0.00	88.89	0.00	2.30 L		N/A
NRGNR	Grandview	23	22	33 L=<25%	8	Н	554	0.00	41.38	6.90	2.30 L		>90%
NRGNR	Grandview	23	22	34 L=<25%	10	H	555	3.08	52.31	16.92	19.40 L		>90%
NRGNR	Grandview	23	22	34 L=<25%	10	H	558	0.00	94.12	0.00	19.40 L		N/A
NRGNR	Grandview	23	22	34 L=<25%	10	Н	556	0.00	95.24	1.59	19.40 L		N/A
NRGNR	Grandview	23	22	31 M=25-50%	10	MD	547	0.00	41.67	62.50	37.53 M		N/A
NRGNR	Grandview	23	22	32 L=<25%	12	LD	551	4.00	76.00	12.00	6.00 L		>90%
NRGNR	Grandview	23	22	28 L=<25%	12	LD	537	2.82	22.54	2.82	18.02 L		N/A
NRGNR_	Grandview	23	22	26 L=<25%	10	Н	533	6.67	40.00	0.00	10.00 L		N/A
NRGNR	Grandview	23	22	27 None	10	Н	535	3.33	46.67	0.00	0.00 N		N/A
NRGNR	Grandview	23	22	25 L=<25%	10	H	530	5.26	84.21	42.11	22.67 L		>90%
NRGNR	Grandview	23	22	26 L=<25%	10	Н	532	6.67	80.00	20.00	10.00 L		>90%
NRGNR	Grandview	23	22	27 None	10	Н	534	0.00	91.30	0.00	0.00 N		N/A
NRGNR	Grandview	24	36	38 M=25-50%	12	LD	570	0.00	35.14	16.22	36.41 M		N/A
NRGNR	Grandview	24	36	35 M=25-50%	14	Н	559	11.94	25.37	26.87	49.55 M		N/A
NRGNR	Grandview	24	36	35 M=25-50%	14	Н	560	0.00	41.94	90.32	49.55 M		51-90%
NRGNR	Grandview	24	36	35 M=25-50%	14	H	561	11.76	41.18	35.29	49.55 M		N/A
NRGNIR	Grandview	24	36	36 L=<25%	10	LD	564	6.06	9.09	12.12	6.06 L		>90%
NRGNR	Grandview	24	36	36 L=<25%	10	LD	563	0.00	65.52	0.00	6.06 L		N/A
NRGNR	Grandview	24	36	37 M=25-50%	8	LD	565	22.39	49.25	11.94	9.15 L		N/A
NRGNR	Grandview	24	36	37 M=25-50%	8	LD	566	5.26	76.32	5.26	9.15 L		51-90%
NRGNR	Grandview	24	36	35 M=25-50%	14	Н	562	8.57	57.14	45.71	49.55 M		N/A
NRGNR	Grandview	24	36	37 M=25-50%	8	LD	567	0.00	51.28	10.26	9.15 L		N/A
NRGNR	Grandview	24	36	38 M=25-50%	12	LD	568	0.00	76.92	61.54	36.41 M		51-90%
NRGNR	Grandview	24	36	38 M=25-50%	12	LD	569	0.00	22.22	31.48	36.41 M		N/A
NRGNR	Grandview	24	36	39 L=<25%	14	LD	573	17.95	0.00	0.00	0.34 L		N/A
NRGNR	Grandview	24	36	39 L=<25%	14	LD	571	0.00	32.65	1.02	0.34 L		51-90%
NRGNR	Grandview	24	36	39 L=<25%	14	LD	572	0.00	48.98	0.00	0.34 L		N/A
NRGNR	Grandview	25	37	42 M=25-50%	12	MD	581	0.00	24.32	75.68	40.74 M		51-90%
NRGNR	Grandview	25	37	41 M=25-50%	10	MD	578	9.30	9.30	30.23	56.92 H		N/A
NRGNR	Grandview	25	37	42 M=25-50%	12	MD	580	0.00	21.43	32.14	40.74 M		N/A
NRGNR	Grandview	25	37	42 M=25-50%	12	MD	582	0.00	0.00	49.02	40.74 M		N/A
NRGNR	Grandview	25	37	42 M=25-50%	12	MD	583	0.00	32.65	6.12	40.74 M		N/A
NRGNR	Grandview	25	37	41 M=25-50%	10	MD	577	1.61	45.16	70.97	56,92 H		<50%
NRGNR	Grandview	25	37	41 M=25-50%	10	MD	579	0.00	0.00	69.57	56.92 H		N/A
NRGNR	Grandview	25	37.	40 L=<25%	12	MD	574	58.33	5.56	47,22	21.99 L		N/A
NRGNR	Grandview	25	37	40 L=<25%	12	MD	575	3.13	12.50	18.75	21.99 L		51-90%
NRGNR	Grandview	25	37	40 L=<25%	12	MD	576	0.00	15.22	0.00	21.99;L		N/A
NRGNR	Grandview	26	38	46 M=25-50%	6	Н	593	0.00	75.68	0.00	2.50 L		N/A

Circ	Location Name	PlottO	Plot#	Prev HWA FreeID Density Est	DBH	Vinc	Branchill	Percent.	Percent Tip Now	Branch HWA	Tree HWA	Tree HWA	HWA TW
Sile NRGNR	Grandview	26	38	FreeID Density Est 46 M=25-50%	6	H	BranchID 594	Tip Dead 2.50	7ip New 85.00	Percent 7.50	Avg Percent 2.50 L	Avg Density	Mortality Est
NRGNR	Grandview	26	38	45 M=25-50%	14	LD	591	5.97	71.64	10.45	8.72 L		51-90% N/A
NRGNR	Grandview	26	38	45 M=25-50%	14	LD	590	0.00	56.14	8.77	8.72 L		N/A
NRGNR	Grandview	26	38	45 M=25-50%	14	LD	592	2.94	61.76	8.82	8.72 L		>90%
NRGNR	Grandview	26	38	45 M=25-50%	14	LD	589	2.27	75.00	6.82	8.72 L		>90%
NRGNR	Grandview	26	38	44 L=<25%	8	LD	588	0.00	56.14	14.04	9.06 L		51-90%
NRGNR	Grandview	26	38	44 L=<25%	8	LD	587	8.16	55.10	4.08	9.06 L		N/A
NRGNR	Grandview	26	38	43 L=<25%	10	MD	586	0.00	82.09	4.48	15.11 L		N/A
NRGNR	Grandview	26	38	43 L=<25%	10	MD	585	2.63	63.16	38.16	15.11 L		<50%
NRGNR	Grandview	26	38	46 M=25-50%	6	Н	595	4.35	89.13	0.00	2.50 L		N/A
NRGNR	Grandview	26	38	43 L=<25%	10	MD	584	56.76	27.03	2.70	15.11 L		N/A
NRGNR	Grandview	27	39	51 L=<25%	10	MD	612	0.00	56.52	39.13	13.04 L		>90%
NRGNR	Grandview	27	39	48 L=<25%	8	Н	600	1.56	37.50	45.31	29.95 M		>90%
NRGNR	Grandview	27	39	48 L=<25%	8	Н	603	0.00	70.21	40.43	29.95 M		>90%
NRGNR	Grandview	27	39	48 L=<25%	8	1H	601	0.00	8.82	23.53	29.95 M		N/A
NRGNR	Grandview	27	39	47 L=<25%	10	Н	598	0.00	94.74	0.00	0.00 N		N/A
NRGNR	Grandview	27	39	47 L=<25%	10	Н	597	0.00	66.67	0.00	0.00 N		N/A
NRGNR	Grandview	27	39	47!L=<25%	10	Н	596	0.00	78.18	0.00	0.00 N		N/A
NRGNR	Grandview	27	39	47 L=<25%	10	Н	599	0.00	47.95	0.00	0.00 N		N/A
NRGNR	Grandview	27	39	52 None	12	Н	616	13.64	61.36	0.00	0.00 N	#7-11-0:	N/A
NRGNR	Grandview	27	39	49 L=<25%	10	LD	604	13.51	62.16	2.70	0.90 L		>90%
NRGNR	Grandview	27	39	52 None	12	Н	614	0.00	68.42	0.00	0.00 N		N/A
NRGNR	Grandview	27	39	53 L=<25%	10	LD	619	1.59	60.32	3.17	3.96 L		N/A
NRGNR		27	39	53 L=<25%	10	LD	618	4.17	56.25	0.00	3.96 L		N/A
NRGNR	Grandview	27	39	48 L=<25%	8	Н	602	0.00	65.79	10.53	29.95 M		
tion of the same		27	39	52 None	12	Н	615	3.51	61.40	0.00	0.00 N		N/A
NRGNR	Grandview	27	39	49 L=<25%	10	LD	606	3.70	59.26	0.00	0.90 L		N/A N/A
NRGNR	Grandview	27	39	52 None	12	Н	613	0.00	97.44	0.00	0.90 L		N/A
NRGNR	Grandview Grandview	27	39	51 L=<25%	10	MD	611	0.00	66.07	0.00	13.04 L		the second second
NRGNR		27	39	51 L=<25%	10	MD	610	27.27	45.45	0.00	13.04 L		N/A
NRGNR	Grandview	27	39	50 L=<25%	10	MD	609	3.77	49.06	0.00	2.67 L		N/A N/A
NRGNR	Grandview	27	39	50 L=<25%	10	MD	608	15.52	41.38	0.00	2.67 L		N/A
NRGNR	Grandview	27	39	50 L=<25%	10	MD	607	12.00	46.00	8.00	2.67 L		
NRGNR	Grandview	27	39	49 L=<25%	10	LD	605	15.22	58.70	0.00	0.90 L		N/A N/A
NRGNR	Grandview Grandview	27	39	53 L=<25%	10	LD	617	2.17	6.52	8.70	3.96 L		N/A
NRGNR	Grandview	28	40	57 None	14	MD	630	27.78	34.44	0.00	0.00iN		N/A
NRGNR	Grandview	28	40	59 None	24	Н	639	0.00	100.00	0.00	0.00 N		N/A
NRGNR	Grandview	28	40	59 None	24	Н	638	0.00	100.00	0.00	0.00 N		N/A
NRGNR	Grandview	28	40	59 None	24	Н	637	0.00	92.31	0.00	0.00 N		N/A
NRGNR	Grandview	28	40	59 None	24	H	636	0.00	62.22	0.00	0.00 N		N/A
NRGNR	Grandview	28	40	58 None	6	Н	634	0.00	100.00	0.00	0.00!N		N/A
V-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1			40	58 None	6	Н	633	0.00	100.00	0.00	0.00 N		
NRGNR	Grandview	28	40	57 None	14	MD	631	0.00	80.00	0.00	0.00 N		N/A
NRGNR	Grandview	28	40	57 None	14	MD							N/A
	Grandview	28	40	56 None	10	LD	632	4.48 24.53	43.28 24.53	0.00	N ₁ 00.0 N ₁ 00.0		N/A
NRGNR	Grandview	28	40	56 None	10	LD	628	22.95	24.53	0.00	0.00 N		N/A N/A
NRGNR	Grandview	28	40	58 None	6	Н	635	0.00	100.00	0.00	0.00 N		
NRGNR	Grandview	28			14	LD	286,00000	24-1					N/A
NRGNR	Grandview		40	56 None	10		627	22.35	21.18	0.00	N:00.0		N/A
NRGNR	Grandview	28	40	55:None	12	H	625	0.00	100.00	0.00	N 00.0		N/A
NRGNR	Grandview	28		55 None	12	Н	626	0.00	89.4	0.00	0.00 N		N/A_
NRGNR	Grandview	28	40	54!L=<25%	16	H	623	0.00	62.71	0.00	1.45 L		N/A
NRGNR	Grandview	28	40	54 L=<25%	16	H	621	0.00	56.60	0.00	1.45 L		N/A
NRGNR	Grandview	28!	40	54 L=<25%	16	Н	620	0.00	100.00	0.00	1.45 L		N/A

Site	Location Name	PiotID P	let # TreeID	Prev HWA Density Est	DBH	Vigor	BranchID	Percent Tip Dead	Percent Tip New	Branch HWA Percent	Tree HWA Avg Percent	Tree HWA Avg Density	HWA Mortality Est
NRGNR	Grandview	28		1 L=<25%	16	Н	622	2.90	73.91	5.80	1.45 L	ring Density	>90%
VRGNR	Grandview	28	40 55	None	12	Н	624	0.00	94.83	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29	1 63	3 L=<25%	14	H	650	0.00	62.26	7.55	18.79 L		51-90%
NRGNR	Kate's Branch	29	1 64	4 L=<25%	6	Н	654	0.00	90.48	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29	1 64	4 L=<25%	6	Н	655	3.70	90,74	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		4 L=<25%	6	Н	656	2.94	85.29	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		4 L=<25%	6	Н	657	0.00	85.71	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29	- 100	5 L=<25%	12	LD	661	2.78	27.78	2.78	0.69 L		N/A
NRGNR	Kate's Branch	29		5 L=<25%	12	LD	660	28.57	31.43	0.00	0.69 L	-10	N/A
NRGNR	Kate's Branch	29		5 L=<25%	12	LD	659	12.24	20,41	0.00	0.69 L		N/A
NRGNR	Kate's Branch	29		1 L=<25%	14	Н	644	0.00	45.10	0.00	0.76 L		>90%
NRGNR	Kate's Branch	29		6 L=<25%	10	LD	663	2.44	53.66	0.00	0.00 N		N/A
NRGNR	Kaite'sBranch	29		6 L=<25%	10	LD	662	0.00	27.03	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		5 L=<25%	12	LD	658	5.56	16.67	0.00	0.69 L		N/A
NRGNR	Kate's Branch	29		3:L=<25%	14	Н	653	10.64	46.81	4.26	18.79 L		51-90%
NRGNR	Kate's Branch	29		3:L=<25%	14	Н	652	0.00	1.64	60.66	18.79 L		51-90%
NRGNR	Kate's Branch	29		3(L=<25%	14	Н	651	2.70	72.97	2.70	18.79 L		51-90%
NRGNR	Kate's Branch	29		2 L=<25%	10	Н	649	21.05	57.89	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		2 L=<25%	10	H	646	16.28	53.49	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		2 L=<25%	10	Н	648	2.70	59.46	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		2 L=<25%	10	Н	647	25.00	62.50	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		1 L=<25%	14	Н	643	0.00	36.36	3.03	0.76 L		>90%
NRCNR	Kate's Branch	29		1 L=<25%	14	Н	645	21.43	50.00	0.00	0.76 L		N/A
NRGNR	Kate's Branch	29		DL=<25%	18	Н	641	5.36	48.21	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		L=<25%	18	Н	640	6.52	60.87	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		1 L=<25%	8	Н	678	23.68	57.89	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		6 L=<25%	10	LD	664	2.70	54.05	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		1 L=<25%	14	Н	642	2.08	47.92	0.00	0.76 L		N/A
NRGNR	Kate's Branch	29		L=<25%	8	Н	676	2.44	53.66	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		9 L=<25%	18	Н	672	0.00	92.00	0.00	1.32 L		N/A
NRGNR	Kate's Branch	29		3 L=<25%	8	Н	686	1.79	100.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		3 L=<25%	8	Н	685	2.50	80.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		2 L=<25%	20	Η	680	11.76	76.47	11.76	5.16 L		51-90%
NRGNR	Kate's Branch	29		2 L=<25%	20	Н	681	0.00	50.00	0.00	5.16 L		N/A
NRGNR	Kate's Branch	29		2 L=<25%	20	Н	683	4.44	22.22	0.00	5.16 L		N/A
NRGNR	Kate's Branch	29		2 L=<25%	20	Н	682	0.00	40.00	8.89	5.16 L		51-90%
NRGNR	Kate's Branch	29	1 7	1 L=<25%	8	Н	679	0.00	64.71	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		D L=<25%	8	Н	675	10.00	70.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		9 L=<25%	18	Н	673	6.98	44.19	0.00	1.32 L		N/A
NRGNR	Kate's Branch	29		9 L=<25%	18	Н	674	0.00	84.21	5.26	1.32 L		>90%
NRGNR	Kate's Branch	29		9 L=<25%	18	Н	671	0.00	48.65	0.00	1.32 L		N/A
NRGNR	Kate's Branch	29	1 68	8 L=<25%	10	LD	670	0.00	84.85	0.00	0.00/N		N/A
NRGNR	Kate's Branch	29		8 L=<25%	10	LD	668	4.05	64.86	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29	1 68	8 L=<25%	10	LD	669	0.00	39.47	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29	1 6	7 L=<25%	10	Н	666	0.00	66.13	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		7 L=<25%	10	Н	667	0.00	26.67	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		0·L=<25%	8	Н	677	0.00	25.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		3 L=<25%	8	Н	687	0.00	100.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		3 L=<25%	8	Н	684	0.00	84.62	0.00	0.00 N		N/A
NRGNR	Kate's Branch	29		6 L=<25%	10	LD	665	4.65	76.74	0.00	0.00 N		N/A
NRGNR	Kate's Branch	30		1 L=<25%	10	Н	717	3.51	75.44	0.00	0.00 N		N/A
NRGNR	Kate's Branch	30		9 L=<25%	10	Н	706	5.00	63.33	0.00	2.07 L		N/A
	R Kate's Branch	30		3 L=<25%	18	Н	722	7.32	82.93	2.44	0.81 L		N/A

Site	Location Name.	PI dID	Plot#	TreeID	Prev HWA Density Est	DBH	Wines	BranchiD	Percent Tip Dead	Percent Tip New	Branch HWA Percent	Tree HWA	Tree HVVA	HWA
NRGNR	Kate's Branch	30		-	L=<25%	8	H	724	6.06	63.64	0.00	Avg Percent	Avg Density	Mortality Est
NRGNR	Kate's Branch	30		_	L=<25%	8	Н	723	0.00	90.00	0.00	0.81 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	Н	723	5.41	72.97	0.00	1.49;L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	H	721	0.00	68.09	2.13	1.49 L		N/A N/A
NRGNR	Kate's Branch	30			L=<25%	10	Н	719	3.85	42.31	3.85	1.49 L		
NRGNR	Kate's Branch	30			L=<25%	10	Н	713	0.00	69.09	0.00	0.00 N		51-90%
NRGNR	Kate's Branch	30			L=<25%	10	Н	714	0.00	93.02	0.00			N/A
NRGNR	Kate's Branch	30		P.	L=<25%	10	Н	715	0.00	93.62	0.00	0.00 N 0.00 N		N/A
NRGNR	Kate's Branch	30			L=<25%	110	IH.	710	0.00	68.52	0.00			N/A
NRGNR	Kate's Branch	30			L=<25%	10	Н	713	0.00	85.33	0.00	0.00 N 0.00 N		N/A
NRGNR		30			L=<25%	10	Н	713	0.00	84.78	0.00			N/A
	Kate's Branch	30					Н			84.62	0.00	0.00 N		N/A
NRGNR	Kate's Branch	30			L=<25%	10		711	0.00			0.00 N		N/A
NRGNR	Kate's Branch	the second second second			L=<25%	10	H	709	0.00	72.22	0.00	2.07 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	H	718	0.00	15.79	0.00	1,49 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	H	708	2.86	91.43	2.86	2.07 L		N/A
NRGNR	Kate's Branch	30		-	L=<25%	10	H	707	2.70	64.86	5.41	2.07 L		>90%
NRGNR	Kate's Branch	30			L=<25%	16	Н	688	7.81	57.81	0.00	0.00 N		N/A
NRGNR	Kate's Branch	30			L=<25%	12	Н	695	5.26	81.58	0.00	3.19 L		N/A
NRGNR	Kate's Branch	30	-		L=<25%	10	Н	705	3.80	94.94	1.27	2.70 L		>90%
NRGNR	Kate's Branch	30			L=<25%	10	Н	704	0.00	100.00	0.00	2.70 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	Н	703	0.00	100.00	0.00	2.70 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	Н	702	4.76	57.14	9.52	2.70 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	Н	698	6.25	50.00	0.00	1.47 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	H	701	1.92	76.92	0.00	1.47 L		N/A
NRGNR	Kate's Branch	30			L=<25%	10	Н	700	6.38	89.36	0.00	1.47 L		N/A
NRGNR	Kate's Branch	30			L=<25%	12	[H	696	0.00	95.16	0.00	3.19 L		N/A
NRGNR	Kate's Branch	30			L=<25%	12	Н	694	0.00	63.83	12.77	3.19:L		>90%
NRGNR	Kate's Branch	30			L=<25%	12	Н	697	59.52	4.76	0.00	3.19 L		N/A
NRGNR	Kate's Branch	30			L=<25%	12	Н	692	0.00	91.67	4.17	1.39 L		>90%
NRGNR	Kate's Branch	30			L=<25%	12	Н	691	0.00	50.00	0.00	1.39 L		N/A
NRGNR	Kate's Branch	30			L=<25%	12	Н	693	5.88	82.35	0.00	1.39 L		N/A
NRGNR	Kate's Branch	30	Carried Contract		L=<25%	116	H	690	2.56	46.15	0.00	0.00 N		N/A
NRGNR	Kate's Branch	30			L=<25%	16	Н	689	3.23	83.87	0.00	0.00 N		N/A
NRGNR	Kate's Branch	30			L=<25%	10	H	699	5.88	88.24	5.88	1.47 L		>90%
NRGNR	Kate's Branch	31			L=<25%	20	Н	725	0.00	63.46	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31			L=<25%	10	Н	727	2.27	72.73	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31			L=<25%	22	LD	735	0.00	46.30	0.00	0.54L		N/A
NRGNR	Kate's Branch	31	1		L=<25%	18	H	745	0.00	97.30	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	2		L=<25%	18	Н	744	0.00	100.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	3	90	L=<25%	18	Н	743	0.00	100.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	3	90	L=<25%	18	Н	742	0.00	95.59	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	3	89	L=<25%	12	H	741	10.71	85.71	0.00	15.79 L		N/A
NRGNR	Kate's Branch	31	3	89	L=<25%	12	Н	739	0.00	57.78	0.00	15.79 L		N/A
NRGNR	Kate's Branch	31	3	89	L=<25%	.12	Н	740	2.63	0.00	47.37	15.79 L		51-90%
NRGNR	Kate's Branch	31	3	84	L=<25%	20	Н	726	0.00	64.52	0.00	0.00!N		N/A
NRGNR	Kate's Branch	31	3	88	L=<25%	22	LD	736	0.00	84.78	2.17	0.54 L		>90%
NRGNR	Kate's Branch	31	3	88	L=<25%	22	LD	738	3.51	38.60	0.00	0.54 L		N/A
NRGNR	Kate's Branch	31	3	87	L=<25%	12	Н	734	0.00	95.56	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	3	87	L=<25%	12	Н	733	3.57	62.50	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	3	i 86	L=<25%	14	Н	732	12.90	0.00	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	3	86	L=<25%	14	Н	731	0.00	83.67	0.00	0.00 N		N/A
NRGNR	Kate's Branch	31	3	86	L=<25%	14	Н	730	2.50	80.00	0.00	0.00¦N		N/A
NRGNR	Kate's Branch	31	3	85	L=<25%	10	Н	729	6.00	38.00	0.00	0.00lN		N/A

Site	Location Name	PlotID	Plot#	Prev HWA TreeID Density Est	DBI	Vigor		Percent Tip Dead	Percent Tip New	Branch HWA Percent	Tree HWA	Tree HWA Avg Density	HWA Mortality Est
NRGNR	Kate's Branch	31	3	85 L=<25%	10	H	728	0.00	16.00	0.00	0.00 N	AVU DEIISIIV	N/A
NRGNR	Kate's Branch	31	3	88 L=<25%	22	LD	737	1.85	48.15	0.00	0.54 L		N/A
NRGNR	Wolf Creek	32	29	93 H>50%	14	Н	755	2.56	0.00	97.44	90.88 H		51-90%
NRGNR	Wolf Creek	32	29	93 H>50%	14	Н	754	3.92	0.00	82.35	90.88 H		51-90%
NRGNR	Wolf Creek	32	29	93 H>50%	14	H	753	3.57	0.00	92.86	90.88 H		51-90%
NRGNR	Wolf Creek	32	29	92,M=25-50%	10	H	749	2.78	61,11	94.44	60.65 H		51-90%
NRGNR	Wolf Creek	32	29	92 M=25-50%	10	H	752	0.00	84.85	39.39	60.65 H		51-90%
NRGNR	Wolf Creek	32	29	92 M=25-50%	10	Н	751	0.00	43.86	68.42	60.65 H		51-90%
NRGNR	Wolf Creek	32	29	92 M=25-50%	10	Н	750	5.26	68.42	40.35	60.65 H		<50%
NRGNR	Wolf Creek	32	29	91 M=25-50%	8	LD	746	6.82	90.91	22.73	48.96 M		<50%
NRGNR	Wolf Creek	32	29	91 M=25-50%	8	LD	748	15.79	85.96	35.09	48.96 M		<50%
NRGNR	Wolf Creek	32	29	91 M=25-50%	8	LD	747	4.69	65.63	89.06	48.96 M	-31	<50%
NRGNR	Wolf Creek	33	30	99 None	8	Н	765	6.12	57.14	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	98 None	12	Н	763	0.00	27.78	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	95 None	6	Н	758	0.00	48.65	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	101 None	12	Н	772	15.56	55.56	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	101 None	12	Н	773	0.00	82.86	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	100 None	12	Н	769	0.00	50.00	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	100 None	12	Н	768	4.21	49.47	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	100 None	12	Н	767	0.00	48.24	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	100 None	12	Н	770	12.73	70.91	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	99 None	8	Н	766	20.29	46.38	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	98 None	12	Н	764	24.44	48.89	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	97 None	8	Н	762	34.00	54.00	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	97 None	8	Н	761	6.12	40.82	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	101 None	12	Н	774	4.29	65.71	0.00	0.00 N		N/A
NRGNR	WolCreek	33	30	95 None	6	Н	759	14.75	65.57	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	94 None	10	LD	757	15.31	64.29	0.00	0.00 N		N/A
NRGNR	Wolfreek	33	30	94 None	10	LD	756	3.85	65.38	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	96 None	6	Н	760	6.67	58.33	0.00	0.00 N		N/A
NRGNR	Wolf Creek	33	30	101 None	12	H	771	5.17	63.79	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34!	31	102 None	10	Н	778	0.90	50.45	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	106 None	10	Н	787	0.00	18.06	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	106 None	10	Н	788	29.41	35.29	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	105 None	8	Н	786	8.82	64.71	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	105 None	8	Н	785	4.00	54.00	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	104 None	10	H	784	0.00	15.91	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	104 None	10	Н	783	8.57	68.57	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	103 None	10	H	779	4.65	81.40	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	103 None	10	H	782	0.00	26.42	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	103 None	10	Н	781	9.30	93.02	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	103 None	10	Н	780	0.00	55.56	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	102 None	10	Н	777	7.55	60.38	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	102 None	10	Н	776	0.00	37.08	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	102 None	10	Н	775	7.50	42.50	0.00	0.00 N		N/A
NRGNR	Wolf Creek	34	31	106 None	10	Н	789	3.51	59.65	0.00	0.00(N		N/A
NRGNR	Wolf Creek	35	32	110 None	14	Н	801	0.00	40.00	0.00	0.00 N		N/A
NRGNR	Wolf Creek	35	32	113 None	10	Н	810	0.00	7.23	0.00	0.00 N		N/A
NRGNR	Wolf Creek	35	32	113 None	10	Н	809	5.00	62.50	0.00	0.00 N		N/A
NRGNR	Wolf Creek	35	32	113 None	10	Н	812	3.57	32.14	0.00	0.00 N		N/A
NRGNR	Wolf Creek	35	32	113 None	10	Н	811	0.00	58.14	0.00	0.00 N		N/A
NRGNR	Wolf Creek	35	32	112 None	8	Н	808	15.00	30.00	0.00	0.00 N		N/A
NRGNR	Wolf Creek	35	32	112 None	8	Н	807	0.00	46.25	0.00	0.00 N		N/A

				Prev HWA		7,20		CONTRACTOR OF THE PARTY OF THE PARTY.	Percent	Branch HWA	Tree HWA	Tree HWA HW/
Site NRGNR	Wolf Creek	PlottD 35	32	FreeID Density Est				Tip Dead		Rercent	Avg Percent	Avg Density Mortality
NRGNR	Wolf Creek	35	32	112 None 112 None	8	H	806 805	1.92 9.38	30.77	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	111 None	12	Н	804	8.89	40.00	0.00	N 00.0	N/A
NRGNR	Wolf Creek	35	32	110 None	114	В	800	0.00	52.78	0.00	0.00 N 0.00 N	N/A
NRGNR	Wolf Creek	35	32	111 None	12	Н	803	5.00	22.50	0.00		N/A
NRGNR	Wolf Creek	35	32	110 None	14	H	802	5.00	60.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek		32	109 None	10	Н			36.07		0.00 N	N/A
NRGNR	Wolf Creek	35			-		797	29.51		0.00	0.00 N	N/A
		35	32	109 None	10	H	796	3.23	45.16	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	109 None	10	1	798	5.26	68.42	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	109 None	10	H	799	6.90	44.83	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	108 None	14	H	795	4.00	38.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	108 None	14	Н	794	7.81	48.44	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	108 None	14	Н	793	35.29	44.12	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	108 None	14	Н	792	2.38	35.71	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	107 None	8	H	791	3.77	37.74	0.00	0.00 N	N/A
NRGNR	Wolf Creek	35	32	107; None	8	H	790	2.38	16.67	0.00	0.00 N	N/A
NRGNR	Wolf Creek	36	33	114 None	14	Н	816	0.00	65.71	2.86	0.71 L	51-90%
NRGNR	Wolf Creek	36	33	117 None	8	Н	823	0.00	66.67	0.00	0.00: N	N/A
NRGNR	Wolf Creek	36	33	117 None	8	H	825	3.77	69.81	0.00	0.00 N	N/A
NRGNR	Wolf Creek	36	33	117iNone	8	H	824	53.49	13.95	0.00	0,00 N	N/A
NRGNR	Wolf Creek	36	33!	116 ¹ None	8	Н	821	0.00	0.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek	36	33	116 None	8	H	822	3.57	0.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek	36	33	115 None	110	Н	820	0.00	25.68	0.00	0.00 N	N/A
NRGNR	Wolf Creek	36	33	115, None	10	Н	819	8.82	54.41	0.00	0.00 N	N/A
NRGNR	Wolf Creek	36	33	115 None	10	Н	818	2.90	4.35	0.00	0.00 N	N/A
NRGNR	Wolf Creek	36	33	115 None	10	Н	817	9.52	58.73	0.00	0.00 N	N/A
NRGNR	- Wolf Creek	36	33	114 None	14	Н	815	3.77	41.51	0.00	0.71 L	N/A
NRGNR	Wolf Creek	36	33	114 None	114	H	813	0.00	52.00	0.00	0.71 _. L	:N/A
NRGNR	Wolf Creek	36	33	114 None	14	H	814	3.51	45.61	0.00	0.71 L	:N/A
NRGNR	Wolf Creek	37!	34	118 None	8	Н	827	0.00	60.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37!	34	118 None	8	H	829	6.82	77.27	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	118¦None	8	H	826	8.57	71.43	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	122 None	12	H	841	10.17	47.46	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	118¦None	8	H	828	6.90	27.59	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	122 None	12	Н	840	5.97	46.27	0.00	0.00 ₈ N	N/A
NRGNR	Wolf Creek	37	34	121 None	12	Н	838	4.76	34.92	0.00	0.00:N	N/A
NRGNR	Wolf Creek	37	34	121 None	12	Н	839	2.90	46.38	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	120 None	16	Н	834	1.92	46.15	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	120! None	16	H	835	5.26	47.37	0.00	0.00 ⁵ N	N/A
NRGNR	Wolf Creek	37	34	120 None	16	Н	836	3.92	60.78	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	120iNone	16	H	837	10.34	37.93	0.00	0.00 N	IN/A
NRGNR	Wolf Creek	37	34	119 None	14	H	831	0.00	76.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	119!None	14	Н	833	0.00	68.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	119¡None	14	Н	830	4.00	58.00	0.00	0.00 N	N/A
NRGNR	Wolf Creek	37	34	119 None	14	H	832	0.00	73.81	0.00	0.00 N	N/A
NRGNR	Wolf Creek	38	35	127 None	8	Н	854	5.13	71.79	0.00	0.00 ² N	N/A
NRGNR	Wolf Creek	38	35	127 None	8	Н	851	0.00	81.13	0.00	0.00; N	N/A
NRGNR	Wolf Creek	38	35	127!None	8	Н	852	5.88	62.75	0.00	0.00 N	N/A
NRGNR	Wolf Creek	38	35	127 None	8	H	853	0.00	57.14	0.00	0.00 N	N/A
NRGNR	Wolf Creek	38	35	126 None	10	Н	848	8.70	34.78	0.00	0.00 N	N/A
NRGNR	Wolf Creek	38	35	126 None	10	Н	849	0.00	30.61	0.00	0.00'N	N/A
NRGNR	Wolf Creek	38	35	126 None	10	Н	850	10.53	39.47	0.00	0.00 N	N/A
		38	35	125 None		Н	-1				4.4	

Site	Location Name	PlottD	Plot#	TreeID	Prev HWA Density Est	DBH	Vigor	BranchID	Percent Tip Dead	Percent Tip New	Branch HWA Percent	Tree HWA Avg Percent	Tree HWA Avg Density	HWA Mortality Est
IRGNR Wolf C	eek	38	35	125	None	14	Н	847	0.00	37.93	0.00	0.00 N		N/A
IRGNR Wolf C	reek	38	35	124	None	14	H	845	0.00	66.67	0.00	0.00 N		N/A
RGNR Wolf C	reek	38	35	124	None	14	Н	844	0.00	60.87	0.00	0.00 N		N/A
NRGNR Wolf C	reek	38	35	123	None	20	Н	842	9.09	87.88	0.00	0.00 N		N/A
RGNR Wolf C	reek	38	35	123	None	20	Н	843	5.56	38.89	0,00	0.00 N		:N/A
Visual estimate of	previous hwa density													
-DBH= estimated	ree diameter at breast height to	nearest	inch								1			l l
Severe De- Precentage of de- Percentage of tipe- Percentage of tipe Heavy de	the crown Decline (MD) = branch morality crown ecline (SD) = more than 50% of but foliage still prese ad tips per 30 centimeters of he s with new growth per 30 centim s with hwa present per 30 centim shity = (>50% infested), Modera 0% infested)	f the crow ent indicat emlock twi neters of h	n with braing that to g length nemlock to hemlock	anch mor he tree is twig lengt twig leng	tality, dieback alive th gth:	, discol	oration	or leaf dwa	rfing,					
-Visual estimate o	hwa mortality													
•		•	,	•	•	•	•	•	,	•		,		·

Table 1.--Summary of hemlock woolly adelgid survey data collected in June 2005 at the New River Gorge National River, the Gauley River National Recreation Area, and the Bluestone National Scenic River, West Virgina.

Site	L _i ocation Name	PlotiD	:Plot#	TreeID	Vigor ¹	Tree HWA Avg Percent ²	Tree HWA	Plot HWA Avg Percent	Plot HWA
BNSR	Bluestone National Scenic River	61	41		MD	47.99	1 0	53.61	
BNSR	Bluestone National Scenic River	61	41		MD	56.69		53.61	
BNSR	Bluestone National Scenic River	61	41	254	SD	56.99	Н	53.61	Н
BNSR	Bluestone National Scenic River	61	41	255	MD	48.16	M	53.61	Н
BNSR	Bluestone National Scenic River	61	41		MD	58.24	Н	53.61	Н
BNSR	Bluestone National Scenic River	62	42	257	LD	8.72	L	20.39	L
BNSR	Bluestone National Scenic River	62	42	258	MD	19.60	L	20.39	L
BNSR	Bluestone National Scenic River	62	42	259	SD	32.84	M	20.39	L
BNSR	Bluestone National Scenic River	63:	43	260	LD	54.89	Н	30.06	M
BNSR	Bluestone National Scenic River	63	43	261	LD	49.52	М	30.06	M
BNSR	Bluestone National Scenic River	63	43	262	LD	7.30	L	30.06	M
BNSR	Bluestone National Scenic River	63	43	263	LD	19.69	L	30.06	M
BNSR	Bluestone National Scenic River	63	43			18.92	L	30.06	M
BNSR	Bluestone National Scenic River	64	44	265	SD	17.45	L	16.00	L
BNSR	Bluestone National Scenic River	64	44	266	LD	8.08	L	16.00	L
BNSR	Bluestone National Scenic River	64	44	267	MD	21.41	L	16.00	L
BNSR	Bluestone National Scenic River	64	44	268	MD	15.66	L	16.00	L
BNSR	Bluestone National Scenic River	64	44	269	SD	17.37	L	16.00	L
BNSR	Bluestone National Scenic River	65	45		MD	20.38	L	40.30	M
BNSR	Bluestone National Scenic River	65	45	271	MD	28.84	M	40.30	M
BNSR	Bluestone National Scenic River	65	45	272	SD	53.27	Н	40.30	M
BNSR	Bluestone National Scenic River	65	45	273	SD	35.20		40.30	M
BNSR	Bluestone National Scenic River	65	45		MD	37.27	M	40.30	M
BNSR	Bluestone National Scenic River	65	45	275	SD	66.11	Н	40.30	M
BNSR	Bluestone National Scenic River	65	45	276	SD	45.40	M	40.30	M
BNSR	Bluestone National Scenic River	65	45	277	SD	35.93	M	40.30	M
BNSR	Bluestone National Scenic River	66	46	278	MD	34.05	M	53.85	Н
BNSR	Bluestone National Scenic River	66	46	279	MD	33.14	M	53.85	Н
BNSR	Bluestone National Scenic River	66	46	280	SD	47.16	M	53.85	Н
BNSR	Bluestone National Scenic River	66	46	281	MD	60.46	Н	53.85	Н
BNSR	Bluestone National Scenic River	66	46	282	MD	70.00	Н	53.85	Н
BNSR	Bluestone National Scenic River	66	46	283	MD	78.30	Н	53.85	Н
BNSR	Bluestone National Scenic River	67	47	284	LD	30.47	M	32.84	M
BNSR	Bluestone National Scenic River	67	47	285	SD	37.29	M	32.84	M
BNSR	Bluestone National Scenic River	67	47	286	MD	27.16	M	32.84	M
BNSR	Bluestone National Scenic River	67	47	287	MD	45.99	M	32.84	M
BNSR	Bluestone National Scenic River	67	47	288	LD	23.29	L	32.84	M
BNSR	Bluestone National Scenic River	68	48	289		44.16		46.76	
BNSR	Bluestone National Scenic River	68	48	290	SD	39.46	M	46.76	M
BNSR	Bluestone National Scenic River	68	48	291	SD	56.67		46.76	M

						Tree HWA	Tree HWA	Plot HWA	Plot HWA
Site	Location Name	PlotID	Plot #	TreeID	Vigor ¹	MALESTAN STREET, ST. ST.	Avg Density ²		Avg Density

Bluestone National Scenic River 8 plots, 40 trees, 108 branches surveyed HWA population average = Moderate HWA population range = Light to heavy Tree health range = Light to severe decline

GRNRA	Hedrick's Creek	39	10	128 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	129 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	130 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	131 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	132 LD	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	133 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	134 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	135 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	136 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	137 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	39	10	138 H	9.21 L	0.77 L
GRNRA	Hedrick's Creek	39	10	139 H	0.00 N	0.77 L
GRNRA	Hedrick's Creek	40	11	140 H	0.38 L	5.41 L
GRNRA	Hedrick's Creek	40	11	141 H	0.00 N	5.41 L
GRNRA	Hedrick's Creek	40	11	142 H	0.00 N	5.41 L
GRNRA	Hedrick's Creek	40	11	143 H	0.00 N	5.41 L
GRNRA	Hedrick's Creek	40	11	144 H	0.00 N	5.41 L
GRNRA	Hedrick's Creek	40	11	145 H	0.63 L	5.41 L
GRNRA	Hedrick's Creek	40	11	146 LD	61.01 H	5.41 L
GRNRA	Hedrick's Creek	40	11	147 H	0.00 N	5.41 L
GRNRA	Hedrick's Creek	40	11	148 H	2.38 L	5.41 L
GRNRA	Hedrick's Creek	40	11	149 H	4.91 L	5.41 L
GRNRA	Hedrick's Creek	40	11	150 H	0.00 N	5.41 L
GRNRA	Hedrick's Creek	40	11	151 H	0.00 N	5.41 L
GRNRA	Hedrick's Creek	40	11	152 H	1.01 L	5.41 L
GRNRA	Hedrick's Creek	41	12	153 LD	98.41 H	15.25 L
GRNRA	Hedrick's Creek	41	12	154 H	13.92 L	15.25 L
GRNRA	Hedrick's Creek	41	12	155 LD	0.00 N	15 25 L
GRNRA	Hedrick's Creek	41	12	156 H	6.25 L	15.25 L
GRNRA	Hedrick's Creek	41	12	157 H	14.12 L	15.25 L
GRNRA	Hedrick's Creek	41	12	158 H	0.94 L	15.25 L
GRNRA	Hedrick's Creek	41	12	159 H	0.81 L	15.25 L
GRNRA	Hedrick's Creek	41	12	160 H	1.30 L	15.25 L
GRNRA	Hedrick's Creek	41	12	161 H	1.52 L	15.25 L
GRNRA	Hedrick's Creek	42	13	162 H	1.96 L	11.31 L
GRNRA	Hedrick's Creek	42	13	163 H	12.73 L	11.31 L
GRNRA	Hedrick's Creek	42	13	164 H	28.81 M	11.31 L
GRNRA	Hedrick's Creek	42	13	165 H	5.14 L	11.31 L
GRNRA	Hedrick's Creek	42	13	166 H	24.83 L	11.31 L
GRNRA	Hedrick's Creek	42	13	167 H	5.73 L	11.31 L
GRNRA	Hedrick's Creek	42	13	168 H	0.00 N	11.31 L
GRNRA	Hedrick's Creek	43	14	169 H	0.00 N	6.49¹L
GRNRA	Hedrick's Creek	43	14	170 H	0.00 N	6.49 L
GRNRA	Hedrick's Creek	43	14	171 LD	25.98 M	6.49 L
GRNRA	Hedrick's Creek	43	14	172 H	0.00 N	6.49 L

SWANNER I	表示器在图像ASS (SSS)	No.	DE PERSON	The Burkey	KIND SESA	7		TO BE AND SOME	P CONTRACT
ASSESSED.		WALLS.		10000	to birm	Tree HWA		PlotHWA	STATE OF THE PARTY
		E WELL				Avg	TrieeHWA	Avg	Plot HWA
Site	Locatio n Name	PlotID	Plot#	Tre ell	Vigor.	Percent ²	Avg Density ²	Percent	Avg Density

H edrick' €reek 5 plots, 45 trees, 110 branches surveyed HWApopulation average = Light HWApopulation range = None to heavy Tree health range = H ealthyto li ghtdecline

NRGNR	Fern Creek	44	15	173 H	0.00 N	0.13 L
NRGNR	Fern Creek	44	15	174 MD	0.00 N	0.13 L
NRGNR	Fern Creek	44	15	175 LD	0.00 N	0.13 L
NRGNR	Fern Creek	44	15	176 MD	0.00 N	0.13 L
NRG NR	Fern Creek	44	15	177 H	0.00 N	0.13 L
NRGNR	Fern Creek	44	15	178 LD	0.81 L	0.13 L
NRGNR	Fern Creek	45	16	179 H	5.03 L	2.34 L
NRG NR	Fern Creek	45	16	180 H	5.71 L	2.34 L
NRG NR	Fern Creek	45	16	181 H	0.96 L	2.34 L
NRG NR	Fern Creek	45	16	182 H	0.00 N	2.34 L
NRGNR	Fern Creek	45	16	183 H	0.00 N	2.34 L
NRGNR	Fern Creek	46	17	184 H	0.00 N	2.06 L
NRG NR	Fern Creek	46	17	185 H	0.46 L	2.06 L
NRG NR	Fern Creek	46	17	186 H	0.00 N	2 .06
NRG NR	Fern Creek	46	17	187 H	0.00 N	2.06 L
NRG NR	Fern Creek	46	17	188 H	9.83 L	2.06 L
NRG NR	Fern Creek	47	18	189 H	0.00 N	0.72 L
NRG NR	Fern Creek	47	18	190 H	0.00 N	0.72 L
NRG NR	Fern Creek	47	18	191 H	1.80 L	0.72 L
NRGNR	Fern Creek	47	18	192 H	1.09 L	0.72 L
NRGNR	Fern Creek	48	19	193 H	0.39 L	0.20 L
NRGNR	Fern Creek	48	19	194 H	0.00 N	0.20 L
NRGNR	Fern Creek	49	23	195 H	16.63 L	2.77 L
NRGNR	Fern Creek	49	23	196 H	0.00 N	2.77 L
NRGNR	Fern Creek	49	23	197 H	0.00 N	2.77 L
NRGNR	Fern Creek	49	23	198 H	0.00 N	2.77 L
NRG NR	Fern Creek	49	23	199 LD	0.00 N	2.77 L
NRG NR	Fern Creek	49	23	200 LD	0.00 N	2.77 L
NRG NR	Fern Creek	50	24	201 H	0.00 N	0.00 N
NRGINR	Fern Creek	50	24	202 H	0.00 N	0.00 N
NRG NR	Fern Creek	50	24	203 H	0.00 N	0.00 N
NRG NR	Fern Creek	50	24	204 H	0.00 N	0.00 N
NRG NR	Fern Creek	50	24	205 H	0.00 N	0.00 N
NRGNR	Fern Creek	50	24	206 H	0.00 N	0.00 N
NRGNR	Fern Creek	50	24	207 H	0.00 N	0.00 N
NRGNR	Fern Creek	51	25	208 H	0.00 N	1.03 L
NRGINR	Fern Creek	51	25	209 LD	5.17 L	1.03 L
NRG NR	Fern Creek	51	25	210 H	0.00 N	1.03 L
NRGNR	Fern Creek	51	25	211 H	0.00 N	1.03 L
NRGNR	Fern Creek	51	25	212 H	0.00 N	1,03 L
NRGNR	Fern Creek	52	26	213 H	2.54 L	0.51 L
NRGNR	Fern Creek	52	26	214 H	0.00 N	0.51 L
NRG NR	Fern Creek	52	26	215 H	0.00 N	0.51 L
NRGNR	Fern Creek	52	26	216 H	0.00 N	0.51 L
NRGNR	Fern Creek	52	26	217 H	0.00 N	0.51 L

Site	Location Name	PlotiD	Plot#	TreeID	Vigor ¹	Tree HWA Avg	Tree HWA Avg Density ²	Plot HWA Avg Percent	Plot HWA Avg Density
NRGNR	Fern Creek	53	27	218	Н	1.06	L	0.21	L
NRGNR	Fern Creek	53	27	219	Н	0.00	N	0.21	L
NRGNR	Fern Creek	53	27	220	Н	0.00	N	0.21	L
NRGNR	Fern Creek	53	27	221	Н	0.00	N	0.21	L
NRGNR	Fern Creek	53	27	222	Н	0.00	N	0.21	L
NRGNR	Fern Creek	54	28	223	Н	0.00	N	0.00	N
NRGNR	Fern Creek	54	28	224	Н	0.00	N	0.00	N
NRGNR	Fern Creek	54	28	225	Н	0.00	N	0.00	N
NRGNR	Fern Creek	54	28	226	Н	0.00	N	0.00	N

Fern Creek

NRGNR	Glade Creek	55	4	227 LD	43.66 M	22.36 L
NRGNR	Glade Creek	55	4	228 H	9.31 L	22.36 L
NRGNR	Glade Creek	55	4	229 H	0.00 N	22.36 L
NRGNR	Glade Creek	55	4	230 H	0.00 N	22.36 L
NRGNR	Glade Creek	55	4	231 H	0.76 L	22.36 L
NRGNR	Glade Creek	55	4	232 MD	2.78 L	22 36 L
NRGNR	Glade Creek	55	4	233 MD	100.00 H	22.36 L
NRGNR	Glade Creek	56	5	234 LD	2.88 L	7.20 L
NRGNR	Glade Creek	56	5	235 SD	7.95 L	7.20 L
NRGNR	Glade Creek	56	5	236 LD	14.19 L	7.20 L
NRGNR	Glade Creek	56	5	237 H	3.79 L	7.20 L
NRGNR	Glade Creek	57	6	238 MD	0.00 N	2.62 L
NRGNR	Glade Creek	57	6	239 MD	0.00 N	2.62 L
NRGNR	Glade Creek	57	6	240 H	1.08 L	2.62 L
NRGNR	Glade Creek	57	6	241 H	11.76 L	2.62 L
NRGNR	Glade Creek	57	6	242 H	0.74 L	2.62 L
NRGNR	Glade Creek	57	6	243 H	2.13 L	2.62 L
NRGNR	Glade Creek	58	7	244 LD	1.72 L	5.01L
NRGNR	Glade Creek	58	7	245 H	8.30 L	5.01 L
NRGNR	Glade Creek	59	8	246 LD	7.97 L	3.81 L
NRGNR	Glade Creek	59	8	247 MD	2.27 L	3.81 L
NRGNR	Glade Creek	59	8	248 LD	3.39 L	3.81L
NRGNR	Glade(Creek	59	8	249 H	1.61 L	3.81 L
NRGNR	Glade Creek	60	9	250 MD	18.21 L	14.11 L
NRGNR	Glade Creek	60	9	251 LD	10.01 L	14.11 L

Glade Creek

6 plots, 25 trees, 52 branches surveyed HWA population average = Light HWA population range = None to heavy Tree health range = Healthy to moderate decline

NRGNR	Grandview	21	20	12 LD	48.92 M	17.23 L
NRGNR	Grandview	21	20	11 H	0.00 N	17.23 L
NRGNR	Grandview	21	20	10 H	20.00 L	17.23 L

Site	Location Name	PlotID	Plot#	TreeID	Vigor ¹	Tree HWA Avg Percent ²	Tree HWA Avg Density ²	Plot HWA: Avg Percent	Plot HWA Avg Density
NRGNR	Grandview	21	20		LD	0.68		17.23	
NRGNR	Grandview	21	20			0.00		17.23	
NRGNR	Grandview	21	20			42.50		17.23	
NRGNR	Grandview	21	20			8.50		17.23	
NRGNR	Grandview	22	21	17	Н	0.33		12,87	
NRGNR	Grandview	22	21	18	Н	0.62	L	12.87	_
NRGNR	Grandview	22	21	19	Н	1.79	L	12.87	L
NRGNR	Grandview	22	21	20	LD	14.91	L	12.87	L
NRGNR	Grandview	22	21	21	Н	11.90	L	12.87	L
NRGNR	Grandview	22	21	22	LD	20.83	L	12.87	L
NRGNR	Grandview	22	21	23	LD	29.87	M	12.87	L
NRGNR	Grandview	22	21	24	Н	22.73	L	12.87	L
NRGNR	Grandview	23	22	25	Н	22.67	L	11.88	L
NRGNR	Grandview	23	22	26	Н	10.00	L	11.88	L
NRGNR	Grandview	23	22	27	Н	0.00	N	11.88	L
NRGNR	Grandview	23	22	28	LD	18.02	L	11.88	L
NRGNR	Grandview	23	22	29	MD	1.59	L	11.88	L
NRGNR	Grandview	23	22	30	LD	1.31	L	11.88	L
NRGNR	Grandview	23	22	31	MD	37.53	M	11.88	
NRGNR	Grandview	23	22		LD	6.00	L	11.88	L
NRGNR	Grandview	23	22	33	Н	2.30	L	11.88	L
NRGNR	Grandview	23	22	34	Н	19.40	L	11.88	L
NRGNR	Grandview	24	36	35	Н	49.55	M	20.30	L
NRGNR	Grandview	24	36	36	LD	6.06		20.30	L
NRGNR	Grandview	24	36		LD	9.15		20.30	L
NRGNR	Grandview	24	36		LD	36.41		20.30	L
NRGNR	Grandview	24	36		LD	0.34		20.30	
NRGNR	Grandview	25	37		MD	21.99		39.88	
NRGNR	Grandview	25	37		MD	56.92		39.88	1,100
NRGNR	Grandview	25	37		MD	40.74		39.88	
NRGNR	Grandview	26	38		MD	15.11		8.85	and the same of th
NRGNR	Grandview	26	38		LD	9.06		8.85	
NRGNR	Grandview	26	38		LD	8.72		8.85	
NRGNR	Grandview	26	38	46		2.50		8.85	
NRGNR	Grandview	27	39	47		0.00		7.22	
NRGNR	Grandview	27	39	48		29.95		7.22	
NRGNR	Grandview	27	39		LD	0.90		7.22	
NRGNR	Grandview	27	39		MD	2.67		7.22	
NRGNR	Grandview	27	39		MD	13.04		7.22	
NRGNR	Grandview	27	39	52		0.00		7.22	
NRGNR	Grandview	27	39		LD	3.96		7.22	
NRGNR	Grandview	28	40			1.45		0.24	
NRGNR	Grandview	28	40			0.00		0.24	
NRGNR	Grandview	28	40		LD	0.00		0.24	
VRGNR	Grandview	28	40		MD	0.00		0.24	
NRG NR	Grandview	28	40			0.00		0.24	
NRGNR	Grandview	28	40	59	H	0.00	N	0.24	L

Grandview

8 plots, 50 trees, 164 branches surveyed
HWA population average = Light
HWA population range = None to heavy
Tree health range = Healthy to moderate decline

Site	Location Name	PlotID	Plot #	TreeID	Vigor ¹	Tree HWA Avg Percent ²	Tree HWA Avg Density ²	Plot HWA Avg Percent	Plot HWA Avg Density
NRGNR	Kate's Branch	29	1			0.00		1.91	
NRGNR	Kate's Branch	29	1	61	Н	0.76	L	1.91	L
NRGNR	Kate's Branch	29	1	62	Н	0.00	N	1.91	L
NRGNR	Kate's Branch	29	1	63	Н	18.79	L	1.91	L
NRGNR	Kate's Branch	29	1	64	Н	0.00	N	1.91	L
NRGNR	Kate's Branch	29	1	65	LD	0.69	L	1.91	L
NRGNR	Kate's Branch	29	1	66	LD	0.00	N	1.91	L
NRGNR	Kate's Branch	29	1	67	Н	0.00	N	1.91	L
NRGNR	Kate's Branch	29	1	68	LD	0.00	N	1.91	L
NRGNR	Kate's Branch	29	1	69	Н	1.32	L	1.91	L
NRGNR	Kate's Branch	29	1	70	Н	0.00	N	1.91	L
NRGNR	Kate's Branch	29	1	71	Н	0.00	N	1.91	L
NRGNR	Kate's Branch	29	1	72	Н	5.16	L	1.91	L
NRGNR	Kate's Branch	29	1	73	Н	0.00	N	1.91	L
NRGNR	Kate's Branch	30	2	74	Н	0.00	N	1.31	L
NRGNR	Kate's Branch	30	2	75	Н	1.39	L	1.31	L
NRGNR	Kate's Branch	30	2	76	Н	3.19	L	1.31	L
NRGNR	Kate's Branch	30	2	77	H	1.47	L	1.31	L
NRGNR	Kate's Branch	30	2	78	Н	2.70	L	1.31	L
NRGNR	Kate's Branch	30	2	79	Н	2.07	L	1.31	L
NRGNR	Kate's Branch	30	2	80	Н	0.00	N	1.31	L
NRGNR	Kate's Branch	30	2	81	Н	0.00	N	1.31	
NRGNR	Kate's Branch	30	2	82	Н	1.49	L	1.31	L
NRGNR	Kate's Branch	30	2	83	Н	0.81	L	1.31	L
NRGNR	Kate's Branch	31	3	84	H	0.00	N	2.33	L
NRGNR	Kate's Branch	31	3	85	H	0.00	N	2.33	L
NRGNR	Kate's Branch	31	3	86	Н	0.00	N	2.33	L
NRGNR	Kate's Branch	31	3	87	Н	0.00	N	2.33	L
NRGNR	Kate's Branch	31	3		LD	0.54	L	2.33	L
NRGNR	Kate's Branch	31	3	89	Н	15.79	L	2.33	L
NRGNR	Kate's Branch	31	3	90	Н	0.00	N	2.33	L

Kate's Branch 3 plots, 31 trees, 106 branches surveyed HWA population average = Light HWA population range = None to light Tree health range = Healthy to light decline

NRGNR	Wolf Creek	32	29	91 LD	48.96 M	66.83 H
NRGNR	Wolf Creek	32	29	92 H	60.65 H	66.83 H
NRGNR	Wolf Creek	32	29	93 H	90.88 H	66.83 H
NRGNR	Wolf Creek	33	29	94 LD	0.00 N	0.00 N
NRGNR	Wolf Creek	33	30	95 H	0.00 N	0.00 N
NRGNR	Wolf Creek	33	30	96 H	0.00 N	0.00 N
NRGNR	Wolf Creek	33	30	97:H	0.00 N	0.00 N
NRGNR	Wolf Creek	33	30	98(H	0.00 N	0.00 N
NRGNR	Wolf Creek	33	30	99 H	0.00 N	0.00 N
NRGNR	Wolf Creek	33	30	100 H	0.00 N	0.00 N
NRGNR	Wolf Creek	33	30	101 H	0.00 N	0.00 N
NRGNR	Wolf Creek	34	31	102 H	0.00 N	0.00 N
NRGNR	Wolf Creek	34	31	103 H	0.00 N	0.00 N
NRGNR	Wolf Creek	34	31	104 H	0.00 N	0,00 N
NRGNR	Wolf Creek	34	31	105 H	0.00 N	0.00 N
NRGNR	Wolf Creek	34	31!	106:H	0.00 N	0.00 N

Site	Location Name	PiotiD	Plot#	TreeID	Vigor ¹	Tree HWA Avg Percent ²	Tree HWA Avg Density ²	Plot HWA Avg Percent	Plot HWA Avg Density	
NRGNR	Wolf Creek	35	32	107		0.00 N		0.00 N		
NRGNR	Wolf Creek	35	32	108 H 0.00 N		0.00 N				
NRGNR	Wolf Creek	35	32	109 H		0.00 N		0.00 N		
NRGNR	Wolf Creek	35	32	110	Н	0.00 N		0.00 N		
NRGNR	Wolf Creek	35	32	111	Н	0.00	0.00 N		0.00 N	
NRGNR	Wolf Creek	35	32	112 H 0.00 N		0.00 N				
NRGNR	Wolf Creek	35	32	113 H 0.00 N		0.00 N				
NRGNR	Wolf Creek	36	33	114 H 0.71 L		L	0.18 L			
NRGNR	Wolf Creek	36	33	115 H		0.00 N		0.18 L		
NRGNR	Wolf Creek	36	33	116 H		0.00	0.00 N		0.18 L	
NRGNR	Wolf Creek	36	33	117 H		0.00 N		0.18 L		
NRGNR	Wolf Creek	37	34	118 H		0.00 N		0.00 N		
NRGNR	Wolf Creek	37	34	119 H		0.00 N		0.00 N		
NRGNR	Wolf Creek	37	34	120	Н	0.00 N		D.00 N		
NRGNR	Wolf Creek	37	34	121	Н	0.00	0.00 N		0.00 N	
NRGNR	Wolf Creek	37	34	122	Н	0.00	N	0.00	N	
NRGNR	Wolf Creek	38	35	123	Н	0.00 N		0.00 N		
NRGNR	Wolf Creek	38	35	124 H		0.00 N		0.00 N		
NRGNR	Wolf Creek	38	35	125 H		0.00	N	0.00 N		
NRGNR	Wolf Creek	38	35	126	Н	0.00	N	0.00 N		
NRGNR	Wolf Creek	38	35	127	Н	0.00	N	0.00	N	

Wolf Creek
7 plots, 37 trees, 109 branches surveyed
HWA population average = Light
HWA population range = None to heavy
Tree health range = Healthy to light decline

¹Vigor = Tree crown health:

Healthy (H) = tree appears to be in reasonably good health: less than 10% branch or twig mortality, discoloration, or dwarfed leaves present

Light Decline (LD) = branch mortality, twig dieback, foliage discoloration, or dwarfed leaves present on 10-25% of the crown Moderate Decline (MD) = branch morality, twig dieback, foliage discoloration or dwarfed leaves on 26-50% of crown Severe Decline (SD) = more than 50 % of the crown with branch mortality, dieback, discoloration or leaf dwarfing, but foliage still present indicating that the tree is alive

²Average percentage of tips with adelgid present per 30 centimeters (cm) of hemlock twig length: Heavy density= (>50% infested), Moderate density= (50% to 25% infested), Light density= (<25% infested), None = (0% infested)

File Code: 3420

Date: November 17, 2005

Calvin F. Hite, Superintendent New River Gorge National River USDI National Park Service PO Box 246 104 Main Street Glen Jean, WV 25846-0246

Dear Mr. Hite:

Enclosed is a biological evaluation of hemlock woolly adelgid (HWA) at New River Gorge National River (NERI), Gauley River National River (GARI), and Bluestone National Scenic River (BLUE). A total of seven areas were surveyed and included portions of the Bluestone River at BLUE, Hedrick's Creek at GARI, and Fern Creek, Glade Creek, Grandview, Kates Branch and Wolf Creek at NERI. The majority of the hemlocks were found to be in good health, with the exception of BLUE where hemlock trees have declined since the first occurrence of HWA in 2000. HWA population densities are highly variable within all three Parks. Without intervention, impacts to hemlock resources will likely increase as HWA spreads throughout the region.

Resource managers will need to prioritize treatment sites and select individual trees based on the management objectives of the parks. We recommend the following management options to protect important hemlock resources throughout the three parks, keeping in mind that it is not plausible to treat all of the hemlock trees:

- Chemical treatment of high-valued infested hemlock trees using imidacloprid via. soil injection or stem injection as appropriate. Treatment timing for these application methods is spring or fall.
- The release and establishment of Sasajiscymnus tsugae, Scymnus sinuanodulus, and Laricobius nigrinus predatory beetles in lightly infested areas on healthy hemlocks that will not be chemically treated. Releases will take place in the spring or fall.

The chemical treatment will provide short-term (at least 2 years) control on individual trees and may need to be retreated in subsequent years until natural enemy populations become established and provide long range control of HWA.



Please contact Brad Onken (304-285-1546) if you have any questions concerning this report.

Sincerely,

JOHN W. HAZEL

Field Representative MFO

Enclosure

Cc: John Perez, Biologist, NERI

Terry Cacek, NPS, IPM Program Coordinator

Noel Schneeberger, AO